

ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT REPORT

RIVER TERMINAL PROJECT AT MUKTERPUR, MUNSHIGANJ

Prepared by Bangladesh Centre for Advanced Studies for Summit Alliance Port Limited

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RIVER TERMINAL PROJECT, MUKTERPUR, MUNSHIGANJ



Summit Alliance Port Limited

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Prepared by



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ABBREVIATIONS

ADB	Asian Development Bank
AQMP	Air Quality Modeling Project
BCAS	Bangladesh Centre for Advanced Studies
BDT	Bangladesh Taka
BEZ	Bio-ecological zones
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BOD	Bio-Chemical Oxygen Demand
BRTC	Bureau of Research Testing and Consultation
BPDB	Bangladesh Power Development Board
BPC	Bangladesh Petroleum Corporation
BWDB	Bangladesh Water Development Board
CFS	Container Freight Station
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DOE	Department of Environment
DSC	Design and Supervision Consultant
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
ECR	Environment Conservation Rules
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
ECNEC	Executive Committee of the National Economic Council
ESIA	Environment and Social Impact Assessment
EMP	Environmental Management Plan
ESMU	Environmental and Social Monitoring Unit
FGD	Focus Group Discussions
FC	Fecal Coliform
FCC	Fixed Cargo Cranes
FI	Financial Intermediary
FGD	Focus Group Discussion
GOB	Government of Bangladesh

GSB	Geological Survey of Bangladesh
Ha	Hector
IA	Implementing Agency
ICD	Inland Container Depo
IDCOL	Infrastructure Development Company Limited
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KII	Key Informant Interview
NGO	Non-Governmental Organization
NO _x	Oxides of Nitrogen
NMT	Non-Motorized Transport
OSHA	Occupational Safety and Health Administration
OHSAS	Occupational Health and Safety Advisory Services
PCBs	Poly-chlorinated biphenyls
PM	Particulate matter
PMO	Project Management Office
PM 10	Particulate Matter with Aerodynamic Diameter $\leq 10 \mu\text{m}$
PM _{2.5}	Particulate Matter with Aerodynamic Diameter $\leq 2.5 \mu\text{m}$
PPA	Power Purchase Agreement
PPM	Parts Per Million
PRIME	Plume Rise Model Enhancement
SO ₂	Sulfur di Oxide
SAPL	Summit Alliance Port Limited
SPM	Suspended Particulate Matters
TDS	Total Dissolved Solid
TC	Total Coliform
ToR	Term of Reference
TEUs	Twenty-foot Equivalent Units
TSS	Total Suspended Solid
WB	World Bank

EXECUTIVE SUMMARY

SAPL is proposing building of a river port including an inland container depot. The project is proposed at a location on Munshiganj about 30 km from Dhaka on a 5.9 ha own land on the bank of the Dhaleshwary River, approximately 30km south of Dhaka. The proposed river terminal is located in West Muktarpur Village of Panchasar Union under Munshiganj Sadar Upazila of Munshiganj on a 14.5 acre plot of land on the northern bank of the Dhaleshwary River. The GPS coordinates of the plot is N 23°34'28" and E 90°30'43".

The port will have a handling capacity of 120,000 TEU and a storage capacity of 2,500 TEU. The project includes the acquisition of five second-hand and/or new vessels with 100-140 TEUs capacity to operate between Chittagong and Dhaka. The Danish company Seaport Innovations has been hired for design, supervising management and other recommendations (e.g. IT, organization). Civil construction is done by Beehive Engineers Ltd from Bangladesh. Commercial operation date is expected to start end of 2014.

A range of specialized machineries will be used for the operation of the river terminal and container freight station (CFS). These include Fixed Cargo Cranes (FCC), Reach Stackers, and other related container handling equipment. Specially designed flat-bottom barges with shallow drafts will be used for transportation of containers between Dhaka and Chittagong. During full-scale operation, the river terminal will be capable of handling up to 120,000 containers of TEUs (Twenty-foot Equivalent Units) and FEUs (Forty-foot Equivalent Units) annually.

Export and import oriented cargoes and containers will be consolidated at the project site and then these will be transported to Chittagong port and other areas using specially built barges. Import cargo from Chittagong will be unloaded at the river terminal, and will be delivered to destinations in the greater Dhaka area. No refueling of the barges will be done at the proposed river terminal. The existing road from Ponchoboti to West Muktarpur Bridge will be used for transportation cargo and containers to and from the river terminal. The proposed river terminal will not handle any passenger vessel.

The proposed project falls under the “red category” project according to the Environment Conservation Rules 1997, and require carrying out of Environmental and Social Impact Assessment (ESIA). The ESIA of the proposed project has been carried out following the guidelines (GoB, 1997) of the Department of Environment (DoE), and the relevant operational policies and guidelines of the World Bank and the Asian Development Bank.

As part of the ESIA, baseline surveys (physical, ecological and socio-economic) of areas surrounding the project site have been carried out. The approach taken to carry out the baseline survey was to identify the project activities during both construction and operational phases and screen for the most applicable or sensitive environmental and social impacts the project activities might have. Based on this the environmental data like air quality, noise level measurements and surface and ground water analysis has been carried out. Apart from these the baseline information on flora and fauna of the project area has also been carried out. Secondary literature was used for identifying the climatic condition of the project area. For identifying the socio-economic baseline of the area a sample survey was carried out in the area. As part of the disclosure and public consultation process five focus group discussions (FGDs), 8 Key Informant Interview (KIIs), one large consultation meeting and several informal meetings have also been carried out

The SAPL RT project site is located on the northern bank of the Dhaleshwary River, very close to the Muktarpur Bridge. The proposed project area of 14.5 acres site was earlier owned by the cement manufacturing company Holcim. It was later used by the GoB during the construction of the Muktarpur Bridge. The SAPL bought the land from Holcim for the proposed project. The areas surrounding the project site are primarily industrial in nature. A wide range of industries are present in areas surrounding the project site, including cement factories, chemical industries, garment factories, cold storage, and textile mills. Ideal Textile Mills is located on the eastern side and a ship building yard is located on the western side of the project site. A relatively narrow approach road (about 6m wide) connects the project site with the Muktarpur bridge road. The village areas of West Muktarpur have tin shed houses; electricity and gas supply are available in the area. Low-lying land near the village areas are used for agriculture.

The existing road from Ponchoboti to Muktarpur Bridge and the Dhaleshwary River will be used for transportation of cargo/ containers to and from the proposed river terminal. During construction phase, some construction materials are also likely to be transported through the road and river. Because of its importance, road and river condition survey, road and river traffic survey were carried out.

The existing road from Ponchoboti (Narayanganj) to West Muktarpur (Munshiganj) is about 10 km in length. The geometric configuration of roadway is found to be 2-lane undivided and without any geometric treatment. In general, the condition of the road is poor. The road is narrow along many stretches, the road pavement has suffered significant damage, there is no drainage facility along many stretches, and there are no traffic signs along the road. At present due to the presence of high concentration of labor intensive garment and other industries, uncontrolled movement of pedestrians, non-motorized and motorized vehicles, the corridor is operating at very low level of service.

Incremental traffic due to the port activities is an important issue as the traffic in the existing roads are high and any increase may hamper the transportation and communication of the area. Traffic data were collected from on-spot surveys at three key locations (Ponchoboti, Kashipur, and West Muktarpur) along the roadway during September 2014. In general traffic along the roadway is dominated by NMT (non-motorized transport) and 3-wheelers. Other important vehicle types include mini-bus, trucks, pick-ups, motor cycle and freight vehicles. Among the spots surveyed, Ponchoboti was the busiest. Over 1000 vehicles of different types crossed this point each hour (in either direction) during both morning and afternoon. The river transport is dominated the sand loader and passenger carrying launches. Both road traffic and river traffic was found high in the baseline surveys. During the port operation there is need for proper traffic management by the project sponsors. A traffic plan based on staggered incoming and outgoing container trucks and a communication system needs to be in place in order to avoid traffic congestion on the access road.

The water quality in the Dhaleshwary river water in the immediate vicinity of the project

site contains elevated concentration of a number of contaminants that most likely come both from domestic sources (e.g., TC, FC, NH₃) and industrial sources (NH₃, BOD, COD, Sulfate, Lead). Water from Dhaleshwary was analyzed and was found polluted with many of the individual concentration levels of the pollutants higher than the DOE standards. There will be minimal waste water discharge from the operations of the port. There will be generation of some spent lubricant which will be disposed through DOE contractors.

Baseline Air quality is major problem in the project area. There is a number of cement industries located near the proposed project which is primary reason for high concentrations particulate matter. The most significant being the concentration of PM₁₀ in the in and in the vicinity of the project area resulting from the particulate matter generated by these cement plants. The existing baseline air quality was found to be already exceeding the national ambient air quality standards for SPM as well as PM₁₀ significantly. On the other hand, CO, SO_x and NO_x concentrations have been found to be well within the national standards. The air dispersion modeling using AERMOD shows that the predicted PM₁₀ concentration mainly from the 2MW diesel generator is approximately 0.08 microgram per cubic meter. Since the baseline concentration is high the modeled concentration is 146% higher than the DOE standards.

The baseline noise level measurements show that the noise level on the access road side is highest and is higher than the DOE standards. The noise level in the neighborhood of the project site is higher than that within the site. The noise level within the project site is within the acceptable limit prescribed by the Department of Environment for industrial area. The noise dispersion model results reveal that the nearest household receptors living approximately 100 meters away from the project site will be exposed to 32-42 dBA which is within the limits set by the DOE.

Over the years of industrialization of this area the biodiversity of the area has been altered. The previously flood plain ecology has been changed. Most of the river-bank areas have well established industrial structures and current ecological feature of these areas seems to be very minimal. There are only some adaptive floral and faunal diversity now observed.

Water pollution from industrial and domestic sources has also affected the aquatic biodiversity.

The common aquatic floral species in the study areas include Water hyacinth, Khudipana, Kalmi, and Helencha. Most terrestrial floral species particularly the trees and shrubs are cultivated and planted and these have commercial values. No aquatic tree and aquatic shrub were identified within the study area. A total of 41 floral species have been identified, which include 18 tree, 17 herb, and 6 shrub species. A total of 32 aquatic faunal species have been identified in the study area, which include one amphibian, three reptile, four avian, one mammal, and 23 freshwater fish. A total of 56 terrestrial faunal species have been identified in the study area, which include four amphibians, nine reptiles, 33 avians and 10 mammals. No threatened floral species has been identified in the study areas; however, some threatened wildlife and fish species have been identified in and around the proposed project site.

A socio-economic survey was carried out over a radius of 1km and a sample size was 100. This survey report gives a more in-depth insight into the urban population. The population is large in the survey area, with the percentage of children being less in number as compared to the percentage being in the adolescent and old age group. The educational status in this area is much better than areas in the rural setting. There is a higher population of students who have achieved the higher secondary certificate. The primary occupation of the area comprises of business, services and overseas employment. Agricultural practices are minimal as compared to rural areas though they have better irrigation facilities. The household income is higher in the urban area as compared to rural areas. Likewise, the household expenditure in this area is more compared to rural setting. Majority of the expenditure includes food, clothing, education and healthcare. The economic status of the people is far better than those living in the smaller urban growth areas. The housing structure is better; availability of food, clothing, medicine, transport facilities is also very good. They also have better access to amenities and infrastructure such as sanitation, market, bus stand, school, drinking water etc. The health condition of the study area is far better than the rural area population and smaller urban centers mainly because of the industrialization and good road and waterway connectivity. They suffer from fewer diseases and they have better accessibility to medicine facilities.

The households in the study area have more access to electricity and also to natural gas along with other sources.

The environmental issues in the project area are more degraded as compared to rural areas. A small percentage of the population in the survey area has problems with noise pollution. Water and noise pollution is of any form is not a problem for the population in the area. The respondents' in the study area are aware about the project and they feel that the project will provide them with more employment opportunity.

An Environment Management Plan (EMP) has been furnished. The primary objective of EMP is to record environmental impacts resulting from the project activities and to ensure implementation of the identified "mitigation measures" in order to reduce adverse impacts and enhance positive impacts from specific project activities. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operation phases of the project.

A Monitoring Plan has been included with the primary objective of monitoring key environmental parameters to assess the impacts on a regular basis and keep the records. This will help the project sponsors to take corrective actions so that there is minimal impact on the environment and continued improvement. Apart from monitoring key environmental parameters there is need for strong monitoring of traffic flow during the operation phase of the project.

Recommendations

It has been found that most of the adverse impacts resulting from the proposed project during both construction and operational phases could be minimized if appropriate mitigation measures are taken. Accordingly, mitigation and abatement measures to reduce or eliminate potential adverse impacts and to enhance beneficial impacts have been suggested. A monitoring program needs to be put in place to ascertain that the potential impacts have been predicted adequately and that suggested mitigation measures are effective in minimizing adverse impacts. A detailed environment management plan (EMP), including a monitoring program has been developed. It is also recommended that the EMP be effectively implemented in order to identify any changes in the predicted impacts and take appropriate measures to off-set any unexpected adverse effects.

Chapter-1

INTRODUCTION

1.1 Background

SAPL is developing a river depot project that consists of an inland container depot (located on 5.9 ha owned land at the Dhaleshwari River, approx. 30km south of Dhaka) with a handling capacity of 120,000 TEU p.a. and a storage capacity of 2,500 TEU. The project includes the acquisition of five second-hand and/or new vessels with 100-140 TEUs capacity to operate between Chittagong and Dhaka. The Danish company Seaport Innovations has been hired for design, supervising management and other recommendations (e.g. IT, organization). Civil construction is done by Beehive Engineers Ltd from Bangladesh. Commercial operation date is expected to start end of 2014.

The operations of Chittagong port, the main hub of country's external trade, include clearance of dry cargo from the port in three forms of transportation – road, rail and river ways. However, available data suggest that the share of water transport is decreasing compared to road transport, primarily due to lack of proper infrastructure. The share of road transportation is increasing despite the fact that waterways are the most fuel efficient mode of freight transport. Water transportation reduces at least 40 percent cost, compared to roads or rail transportation; barge shipments are 10 to 15 percent less expensive than truck or rail (SAPL RT, 2011).

According to an Asian Development Bank report, Bangladesh's GDP can grow by more than 1 percent and foreign trade by 20 percent, if the inland water transportation system is made effective, efficient, competitive and free of bureaucratic influence.

Considering these issues, Summit Alliance Port Limited River Terminal (SAPLRT) is developing a river depot project that consists of an inland container depot (located on 5.9 ha owned land at the Dhaleshwari River, approx. 30km south of the Central Business

District of Dhaka) with a handling capacity of 120,000 TEU p.a. and a storage capacity of 2,500 TEU.

The project includes the acquisition of five second-hand vessels with 100-140 TEU capacity to operate between Chittagong and Dhaka. Second hand vessels are easier to acquire in the short term and are available at this moment. SAPL also considers acquiring one or two newly built vessels.

The Project will be developed, constructed and operated under the same legal entity as the existing operations. The Danish company Seaport Innovations has been hired for design, supervising management and other recommendations (e.g. IT, organisation). Civil construction is being done by Beehive Engineers Ltd from Bangladesh, with whom the Summit Group has worked before.

Commercial operation date was expected mid 2014, but is delayed. SAPL expects the commercial date of operation in the last quarter of 2014. The project has been initiated by SAP's subsidiary Cemcor. SAPL decided for internal reasons to change the name of the project owner into SAPL. All rights and obligations have been taken over by SAPL.

SAPLRT has appointed Bangladesh Centre for Advanced studies (BCAS) as a Consultation for carrying out the Environmental and Social Impact Assessment (ESIA) of the proposed project. In response to the request, BCAS has carried out the ESIA of the proposed inland container river terminal project. The EIA has been carried out following the guidelines (GoB, ECR 1997) of the Department of Environment (DoE, GoB) and relevant safeguard policies of ADB and operational Procedures of the World Bank.

1.2 Project Area

The proposed Summit Alliance Port Limited River Terminal (SAPLRT) project will be set up at West Mukterpur, Munshiganj. The proposed project site is located at Mouza of West Mukterpur, Union- Panchasar, Upazilla- Munshiganj Sadar, Munshigonj, KhatianNo.680 and 318, Dag No. 109,141,142,143,144,145,146,371,372,373,374, 375, 376, 377, Land type- Non agri (offshore land), Total land $-(7+ 7.09)=14.09$ acre, Bangladesh. The proposed project would be set up in the owned purchased land of SAPLRT. The project has an access road which connected with the Mukterpur Bridge road to project site. The River Dhaleshwary, situated on the South side is adjacent to the project. The location is well communicated by road and river ways.

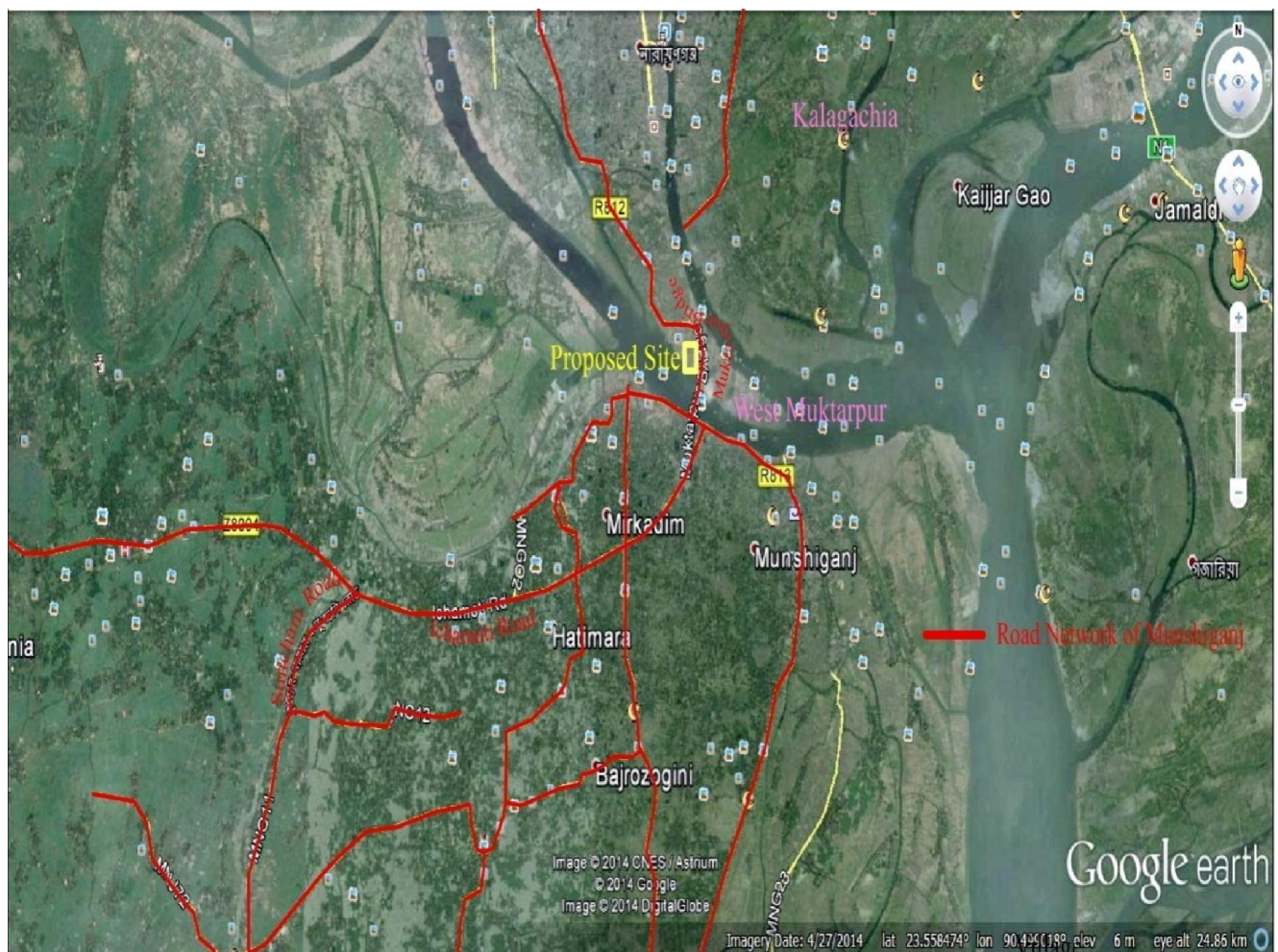


Figure 1.1 : SAPLRT project site in the Google map

1.3 Extent of the Study

Bangladesh Environmental Conservation Rules (ECR, 1997) and ADB Safeguard Policy Statement (SPS) 2009 require that the environmental and social impacts of development projects are identified and assessed as part of the planning and design process. Based on the magnitude of potential adverse impacts, mitigation measures are to be planned before starting the implementation of the project. This is done through the environmental assessment process, which has become an integral part of lending operations and project development and implementation worldwide.

Bangladesh Centre for Advanced Studies (BCAS) will carry out detailed Environmental and Social Impact Assessment (ESIA) to comply with DoE Guidelines as well as the ADB Safeguard Policy Statement (SPS) 2009 for the proposed Summit Alliance Port Limited River Terminal (SAPLRT) on BOO basis.

1.4 Project Objective

The objective is to carry out a due diligence of the SAPL's River Depot Project by carrying out an Environmental and Social Impact Assessment (ESIA) which will include baseline data collection and analysis to identify the anticipated environmental and social impacts due to the project and suggest mitigation actions that needs to be taken complying with the DOE regulations 1997, ADB SPS 2009 and IFC Performance Standards.

-  A technical review on all technical data provided by SAPL relevant to the preparation of the ESIA.
-  Review legal and policy frameworks applicable to the preparation of the ESIA (Bangladesh Environmental Conservation Act 1995 and Regulations 1997, IFC performance standards, Equator Principles of FMO, ILO conventions, World Bank Group EHS guidelines ADB SPS 2009 and IDCOL's ESSF);
-  Review Compliance of the TOR provided by IDCOL
-  Preparation of the ESIA document

- ✚ Obtaining of the Environmental Clearance from the Department of Environment;
- ✚ Obtaining the acceptance of the ESIA report by IDCOL

1. 5 SCOPE OF WORK

The description of the environment and social baseline conditions are made encompassing all relevant current baseline data on the environmental and social characteristics of the study area including physical, biological, ecological and social environments. In the backdrop of the above scenarios, the relevant regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of endangered species, land use control, land acquisition, compensation, etc. at every level are described.

In action to the above, an analysis was conducted of reasonable alternatives in meeting the ultimate objects of the project including the 'no action' alternative, site alternatives and alternative means of meeting the energy requirements.

Viewed against these, all significant impacts were identified and evaluated including atmospheric emissions and changes in ambient air quality, discharge of effluent and ambient water quality impacts, changes in ambient noise and local land use patterns, impacts of the project and its activates on the community's access to social infrastructure (e .g. potable water, health centers, school, irrigation and extension services), and local developments.

A socio-economic study was undertaken through sample survey within 1 km radius of the project to assess the demographic distribution, household income and expenditure and type of employment etc. of the local community.

One of the major aspects covered in the ESIA is the stakeholder's consultation. These consultations were through Focused Group Discussion (FGD) with various groups including women, KII wit key stakeholders. At the draft stage of the ESIA a general

consultation meeting was held to discuss the various findings and get their opinion on the findings and incorporate their concerns in the ESIA.

Following identification of potential impacts mitigation measures has been suggested including an Environmental, Safety and Social Management Plan (ESSMP) to mitigate negative impacts has been developed, including a detailed Environmental and Social Management Plan with feasible and cost-effective measures to prevent or reduce significant negative impacts to an acceptable level, and containing detailed implementation plans, monitoring indicators and clear allocation of responsibility among project sponsors construction contractors, government agencies, and community-based organization. In addition, Grievance Redress Mechanism (GRM), Disaster Management Plan and impact of climate change on the project has been included.

1.6 Methodology

Based on the above Scope of Work, the study built upon the baseline survey carried out by BCAS as Environment and Social Consultant for the Environmental and Social Impact Assessment (ESIA) during August- September 2014. The ESIA exercise resulted in a stand-alone report together with a schedule devised by and as per the requirement of DoE and IDCOL.

This ESIA have been carried out primary data generated during the period from August-September 2014 by BCAS. Secondary data was obtained from various sources and field visits. Several field visits had been undertaken to the project location with a view to collect the baseline data and public consultations, the following steps were followed and biodiversity including:

-  Understanding the technical aspects of the proposed River Terminal Container Depot through secondary literature and consultations
-  Collection and confirmation of environmental baseline data on air, water, noise flora and fauna.

- ✚ Identification of potential environmental impacts and evaluating the consequences through using a checklist method;
- ✚ Identification of impacts was undertaken using Checklist Matrix and Issues forecasting tabular methods and modeling if required;
- ✚ Review of the adequacy and efficiency of proposed mitigation measures for the proposed SAPLRT project through public consultations;
- ✚ For the socio-economic study primary data collection from 30% of the total households within 1 km radius of the project area included in the baseline study carried out by BCAS. The criterion for choosing 30% of households within 1 km radius of the project site is based on the expected results of getting a profile of the area. Additionally, since the area is in a mixed commercial cum rural zone the number of household and business institutions are numerous in numbers therefore the survey target group was a mix of rural and commercial households. A number of Focus Group Discussions (FGDs) with the different categories of stakeholders were held including women;
- ✚ Formulation of a monitoring plan for both environmental and social issues. This will be done through primary data collection with emphasis on the tenure of the settlement and the state of the displaced persons livelihood;
- ✚ Detailed survey work was undertaken throughout the impact zone (1km radius) of the project air-shed to inform the preparation of the land use map. During the mapping exercise, in-depth consultations with local stakeholders were carried out to aide accurate identification of suitable plots. Use of maps and also utilization of the historic maps was undertaken for identifying the plots and ground level. Field verification was undertaken by the team leader after the field data collection. Updated GIS version was applied to finalize the land use map; and

This ESIA report has been prepared with the following documents:

- Asian Development Bank (ADB), *Safeguard Policy Statement*, June 2009;

- Department of Environment (DoE), Ministry of Environment and Forest, Government of the People's Republic of Bangladesh, *EIA Guidelines for Mix zone Industrial and residential*, June 1997.
- EHS guidelines for River Terminal Container Depot of IFC.

1.7 Limitation of the Study

The initial baseline were data collected for inclusion in the ESIA study which has been conducted within a limited time frame due to the requirement of the project to go into commercial operation within the month of October, 2014. Additionally, the inclusion of more stakeholders' consultations could have enriched the ESIA. However, the ESIA has been prepared with an emphasis to cover all important environmental and social impacts and formulate pragmatic recommendations for mitigating any adverse environmental impacts.

1.8 The EIA Team

The ESIA team comprises of the following:

1. Dr. Moinul Islam Sharif, EIA Expert	Team Leader
2. Dr. M. Eusuf, Air Dispersion Modeling Expert	Member
3. Khandaker Mainuddin, Economist	Member
4. Mr. Osman Goni Shawkat, Sociologist	Project Coordinator
5. Mr. Shaker Ali, Noise Modeling Expert	Member
6. Mr. Bakul Mia, GIS and Mapping Expert	Member
7. Mr. Moniruzzaman, Field Surveyor	Member
8. Mr. ZH Khan, Field Surveyor	Member
9. Mr. Sohel, Data Analyst and SPSS expert	Member
10. Ms. Dil Meher Banu, DTP Incharge	Member

1.9 Acknowledgement

In preparing the ESIA, various stakeholders were consulted. It comprises a number of government agencies, West Mukterpur Union Parisad, NGOs, Financing Organizations, Bangladesh Inland Water Transport Authority(BIWTA), Bangladesh Water Transport Corporation(BIWTC), Bangladesh Meteorological Department (BMD), Soil Resource Development Institute (SRDI), Bangladesh Bureau of Statistics (BBS), Bangladesh Water Development Board (BWDB), Department of Environment (DOE), Munshigonj and Dhaka, West Mukterpur Govt. Primary School, Department of Agriculture Extension (DAE), Department of Roads and Highways, Fire Service and Civil Defense Office, and Munshigonj Fisheries Officer etc. The ESIA team is grateful to these stakeholders for their contribution to enrich the ESIA report and present the accurate the data in the concern section of the report.

Chapter 2

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

Regulatory requirements in relation to the protection and conservation of the environment and various environmental resources, as well as the protection of the social environment from adverse impacts associated with project activities have been set out by the Government of Bangladesh (GoB) as well as the Asian Development Bank (ADB). These requirements are summarized below.

2.1 Bangladesh Environmental Policy, Regulations, and Guidelines

2.2 National Environmental Policy, 1992

The Bangladesh National Environmental Policy, approved in May 1992, sets out the basic framework for environmental action together with a set of broad sectoral action guidelines. Key elements of the Policy are:

- ✚ Maintaining ecological balance and ensuring sustainable development of the country through protection and conservation of the environment;
- ✚ Protecting the country from natural disasters;
- ✚ Identifying and regulating all activities that pollute and destroy the environment;
- ✚ Ensuring environment-friendly development in all sectors;
- ✚ Ensuring sustainable and environmentally sound management of the natural resources; and
- ✚ Maintaining active association, as far as possible, with all international initiatives related to environment.

The Policy, *inter alia*, seeks to ensure that transport systems, including roads and inland waterways, do not pollute the environment or degrade resources. The Policy states that an Environmental and Social Impact Assessment (ESIA) should be conducted before projects commence.

2.3 National Environment Management Action Plan (NEMAP), 1995

The National Environmental Management Action Plan (NEMAP) is a wide-ranging and multi-faceted plan, which builds on and extends the statements set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements during the period 1995 to 2005, and sets out the framework through which various decisions, plans, legislative measures, rules and regulations toward safeguarding the environment and natural resources including those of biological diversities are to be implemented. NEMAP was developed based on the following broad objectives:

- ✚ Identification of key environmental issues affecting Bangladesh;
- ✚ Identification of actions necessary to halt or reduce the rate of environmental degradation;
- ✚ Improvement of the natural environment;
- ✚ Conservation of habitats and bio-diversity;
- ✚ Promotion of sustainable development; and
- ✚ Improvement of the quality of life of the people.

To this end, it has grouped all the relevant necessary actions under four headings: institutional, sectoral, location-specific and long-term issues. The *institutional* aspects reflect the need for inter-sectoral cooperation to tackle environmental problems that need new and appropriate institutional mechanisms at national and local levels. The *sectoral* aspects reflect the way the Ministries and agencies are organized and make it easier to identify the agency to carry out the recommended actions. The *location-specific* aspect focuses on particularly acute environmental problems at local levels that need to be addressed on a priority basis. The *long-term* issues include environmental degradation of such degree that it might become more serious and threatening than they seem to be if their cognizance is not immediately taken.

According to the NEMAP, the GoB environmental policy makes specific statements on energy and fuel, including the aim to “*Reduce and discourage the use of those fuels that pollute the environment and encourage the use of fuels that are environmentally sound and less harmful.*”

2.4 The Environment Conservation Act, 1995 (subsequent amendments in 2000 and 2002)

The provisions of the Act authorize the Director General (DG) of Department of Environment to undertake any activity he deems fit and necessary to conserve and enhance the quality of environment and to control, prevent and mitigate pollution. The main highlights of the act are:

- Declaration of Ecologically Critical Areas;
- Obtaining Environmental Clearance Certificate;
- Regulation with respect to vehicles emitting smoke harmful for the environment;
- Regulation of development activities from an environmental perspective;
- Promulgation of standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Promulgation of acceptable limits for discharging and emitting waste; and
- Formulation of environmental guidelines relating to control and mitigation of environmental pollution, conservation and improvement of environment.

2.5 Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003)

The Environment Conservation Rules, 1997 are the first set of rules promulgated under the Environment Conservation Act, 1995. These Rules provide for, *inter alia*, the following:

- The national Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust;
- Categorization of industries, development projects and other activities on the basis of actual (for existing industries/development projects/activities) and anticipated (for proposed industries/development projects/activities) pollution load;
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities; and

- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

Depending upon location, size and severity of pollution loads, projects/activities have been classified in the Environmental Conservation Rules (ECRs) into four categories:

1. Green
2. Orange A
3. Orange B
4. Red

The corresponding category related to container port and associated infrastructure (e.g. the construction of a container depot and an access road) is included under:

Schedule-1, Red Category:

- Item 6: Container Depot; and Item 64: includes construction.

The Rules also incorporate “inclusion lists” of projects requiring varying degrees of environmental investigation e.g. all new projects under the ‘red’ category generally will require a two-step assessment procedure. Firstly, an Initial Environmental Examination (IEE) will be required for site clearance, and secondly, if warranted, a full Environmental and Social Impact Assessment (ESIA) for technical clearance. This IEE has been carried out following the TOR provided by SAPL and also on the basis of the Terms of Reference (ToR) for the ESIA (in Annex 12) , which were approved by DoE, in accordance with the requirements of the ECRs, toward obtaining an ‘Environmental Clearance Certificate’ for the proposed project.

2.6 The ESIA Guidelines for Industry, 1997

The ESIA Guidelines is a handbook comprising procedures for preparing an ESIA and for reviewing an ESIA for the benefit of the development partners, ESIA Consultants, reviewers, and academics. While preparing these guidelines, the present environmental status as well as the need for rapid economic development of Bangladesh has been considered. These considerations have essentially resulted in simpler procedures to be followed for preparing and/or reviewing an EIA.

The process for ESIA approval and obtaining an Environmental Clearance Certificate (ECC) from the DoE is illustrated in Figure 2.1 below.

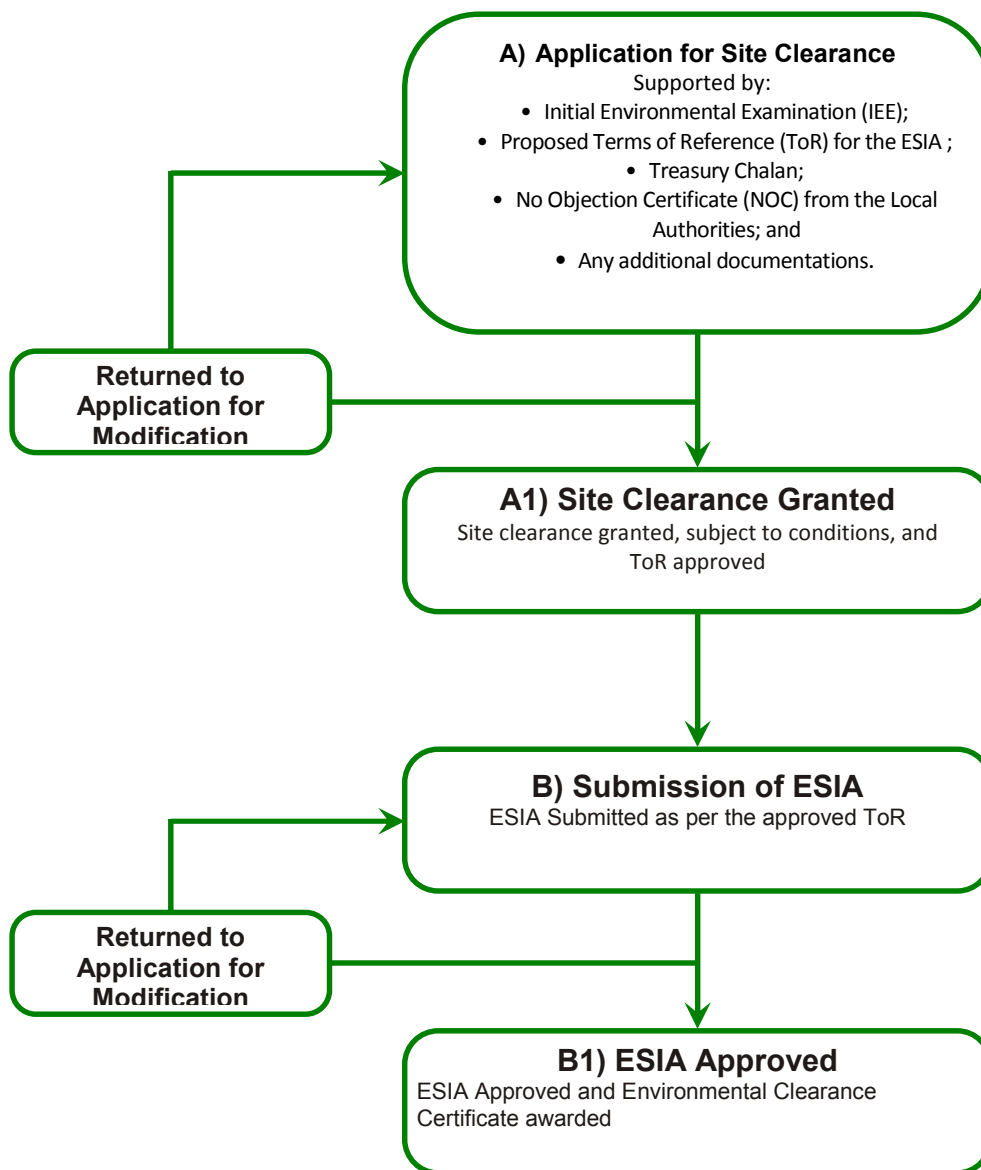


Figure 2.1: Process of ESIA Approval and ECC at DoE

Application for Environmental Clearance at A requires 60 working days to reach A1 with Site Clearance. Submission at B of ESIA as per ToR approved at A1 needs another 90 working days to reach B1 with ESIA approval and Environmental Clearance Certificate (60

working days for ESIA approval and 30 working days for ECC after the applicant/project sponsor completes the formalities as specified in the ESIA approval letter and reports to DoE). ECC issued through such a process remains valid for 1 (one) year, after which renewal is necessary. During stages between A and A1 and between B and B1, observations are made and the applicant may be asked for modification of his/her information/data/reports submitted to DoE for necessary clearance.

2.7 Environmental and Social Requirements of the Asian Development Bank

The Asian Development Bank (ADB) Safeguard Policy Statement ('the SPS') 2009 sets out the requirements for ADB's operations to undertake an environmental assessment for projects funded by the bank. The goal of the SPS is to promote the sustainability of project outcomes through protecting the environment and people from potential adverse impacts. The overall objectives of the SPS are to:

- ✚ avoid adverse impacts of projects on the environment and affected people, where possible;
- ✚ minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is impossible; and
- ✚ help borrowers/clients strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

The SPS sets out the ADB policy objectives, scope and triggers, and principles for following three key safeguard areas:

- ✚ Environmental Safeguards;
- ✚ Involuntary Resettlement Safeguards along with those vis-à-vis Land Acquisition; and
- ✚ Indigenous Peoples Safeguards.

ADB implements the SPS through the safeguard review procedures as outlined in Section F1/OP of its Operation Manual (OM) and the documents cited therein. However, the third area of the above three areas is beyond the scope of IEE consideration for this particular project (SAPLRT) as the project area does not involve any *indigenous peoples*¹.

¹ As defined by the Asian Development Bank policy on Indigenous Peoples, April 1998.

According to ADB Operation Manual activated since 2010, a proposed project is assigned to one of the following categories depending on the significance of the *potential environmental impacts and risks*:

Category A – a proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental and Social Impact Assessment (ESIA), including an Environmental Management Plan (EMP), is required.

Category B – a proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.

Category C – a proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. An ESIA or IEE is not required, although environmental implications need to be reviewed.

Category FI – a proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary (*refer to paragraphs 53–58, Safeguard Review Procedures, Operational Procedures, ADB Operations Manual*).

A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Each proposed project is scrutinized as to its type, location, scale, sensitivity and the magnitude of its potential environmental impacts. The level of detail and comprehensiveness of the ESIA or IEE are commensurate with the significance of the potential impacts and risks.

The proposed Summit Alliance Port Limited River Terminal (SAPLRT) project falls under Category B according to ADB environmental categorization of projects, as the potential exists for significant adverse environmental impacts but there are no irreversible impacts and environmental and social impacts of the proposed project can be mitigated which is

not the case in Category A projects. Therefore, for the proposed project an Initial Environmental Examination (IEE) including an EMP will be required.

The IEE must include an Environmental Management Plan (EMP) that outlines specific mitigation measures, environmental monitoring requirements, and related institutional arrangements, including budget requirements. Loan agreements include specific environmental covenants that describe environmental requirements, including the EMP. The provisions for the EMP must also be fully reflected in the project administration memorandums. To ensure proper and timely implementation of the EMP and adherence to the agreed environmental covenants,

With regards socio-economic impacts, ADB screens all projects to determine whether or not they involve Involuntary Resettlement or have potential impacts on Indigenous Peoples. A project's involuntary resettlement category is determined by the category of its most sensitive component in terms of involuntary resettlement impacts. The Involuntary Resettlement Impacts of an ADB-supported project are considered significant if *"...200 or more persons experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating)."* The level of detail and comprehensiveness of the Resettlement Action Plan (RAP) are commensurate with the significance of the potential impacts and risks. A proposed project is assigned to one of the following categories depending on the significance of the probable involuntary resettlement impacts:

Chapter 3

DESCRIPTION OF THE PROPOSED PROJECT

3.1 Project

SAPL is developing a river depot project that consists of an inland container depot located on 14.5 acre owned land at the Dholeswari River, approx. 30km south of Dhaka) with a handling capacity of 120,000 TEUs p.a. and a storage capacity of 2,500 TEUs. The project includes the acquisition of five second-hand and/or new vessels with 100-140 TEU capacity to operate between Chittagong and Dhaka. The Danish company Seaport Innovations has been hired for design, supervising management and other recommendations (e.g. IT, organization). Civil construction is done by Beehive Engineers Ltd from Bangladesh. Commercial operation date is expected to start mid 2014.

FMO and IDCOL are considering providing senior loans of resp. USD 20.51 million and USD 10 million to be used for the realization of the Project. FMO and IDCOL and commissioned Royal Haskoning DHV to provide a technical review, an environmental and social review, a market review and certifying milestones during construction and review disbursement requests.

The objective is to carry out a due diligence of the SAPL's River Depot Project by reviewing and verifying the project, identifying compliance gaps, mitigation and follow-up actions and outlining a managing/monitoring regime.

3.1.2 Type and Category of the Project

The Summit Alliance Port Limited River Terminal Authority has intended to establish a container depot on the bank of Dalesswari River and obtained Environmental Site Clearance Certificate from Department of Environment (DoE) Vide Letter No. 30.59.56.4.24.240713/admin/clearance-07; Date 26.11.2013 and the approval from Bangladesh Inland Water Transport Authority (BIWTA) vide letter No.18. 765. 045 .00. 00.062. 2010/admin/clearance/630; Date: 11.02.2014.

According to ADB SPS, 2009 and ADB Environmental Assessment Guidelines 2003, the project will fall under Category-B and according to Department of Environment (DoE),

Bangladesh the project will fall under Category A (Red) which requires an ESIA including an EMP.

There are no particularly sensitive ecological, cultural and archeological sites in the area. The terminal port will not involve any relocation of human settlement, as the project is situated on the purchased vacant land of private individuals based on willing sellers and buyer negotiations without any undue influence from the buyer. The area enjoys necessary infrastructure facilities, which include transport, electricity, telecommunication etc. For all construction activities for the port, the provisions of Bangladesh National Building Code (BNBC) have been followed that include structural designs and seismicity tolerance. All the relevant social and environmental risks and potential impacts have been taken due care of as part of the assessment in compliance of the Performance Standards and Safeguard Policy Statement (SPS) set by the World Bank and ADB besides following the guidelines set forth by DoE, Bangladesh

3.1.3 Basic information

Table-3.1: Basic data on SAPLRT is given below:

1	Name of the Project	Summit Alliance Port Limited River Terminal(SAPLRT)
2	Project Proponent	Syed Yasser Haider Rizvi
3	Project Location	West Mukterpur,Panchaser, Munshigonj, Dhaka, Bangladesh
4	Corporate Office	Summit Centre(7 th Floor), 18 Kawran Bazar, Dhaka-1215
5	Main Sponsor	Summit Alliance Port Limited
6	Type of Business	River Port Container Terminal
7	Raw Materials	The main raw material of the project is Export import oriented goods
8	By-product, if any	None
9	Net Container	Total handling capacity 120,000 TEUs with storage capacity of 2500
10	Project Cost	USD 34.68 Million
11	Total Area of Land	14.09 Acres
12	Total Covered Area	14.09 Acres
13	Total Developed Land	14.09 Acres
14	Employment	Administration -15, Production - 47 and Environmental Management – 3, Total 65 Persons
15	Fuel Requirement	Heavy Fuel Oil (furnace oil)

3.1.4 Project Rationale

The cost to transport a 20 foot container by rail between Dhaka and Chittagong is BDT 13,500 per TEU. It must be said that these containers are usually carrying less cargo, around 9 to 10 ton. This a huge opportunity for the River Container Depot projects, especially for:

- 📦 Shippers (cargo owners): the shipper would need to pay only for the moves of cargo from their warehouses to the Dhaka ICD. This will cost approx. BDT 8.500 per TEU(US\$ 109) / It takes around 8 to 10 hours to reach the ICD Dhaka;
- 📦 Shipping lines and freight forwarders. The cost will be BDT 13,500 per TEU (US\$ 170). This includes rail haulage, handling at ICD and stuffing charges.
- 📦 The total costs are estimated at BDT 22,000 or US\$282.

These calculations do not include the waiting time and loss of working capital on the value of the container. This mode of transport is safer. However, most of the freight forwarders are working under pressure and can't wait for 1 or 2 weeks.

Competitive position river container transport

Drewry calculated the transportation cost for a river port in Dhaka, vis-à-vis road haulage and rail. Drewry developed a cost comparison based on 2011 information. SAPL has updated the comparison and the overall impression is that road haulage and rail have increased in price. The conclusions are:

A river based container terminal is 10% cheaper compared to off dock facilities. Handling of container is 10% cheaper than handling the container at the yard (lift on/off) in Chittagong. This is realistic as long as the throughput at the river terminal is high (economies of scale) CFS charges need to be lower than off docking in Chittagong, whereas container storage is the same price. In addition the river based port will charge additional tariffs for stevedoring.

Current Freight charge by waterway from Dhaka to Chittagong port (single trip) are estimated at TEU 150 US dollar (Single trip) and 300 US dollar (Round trip). Source: Station Manger, Pangaon Inland Container Terminal (ICT)

A recent cost comparison from Green Delta Capital shows the following for a laden loaded export 40 foot container is shown in Figure 3.1:

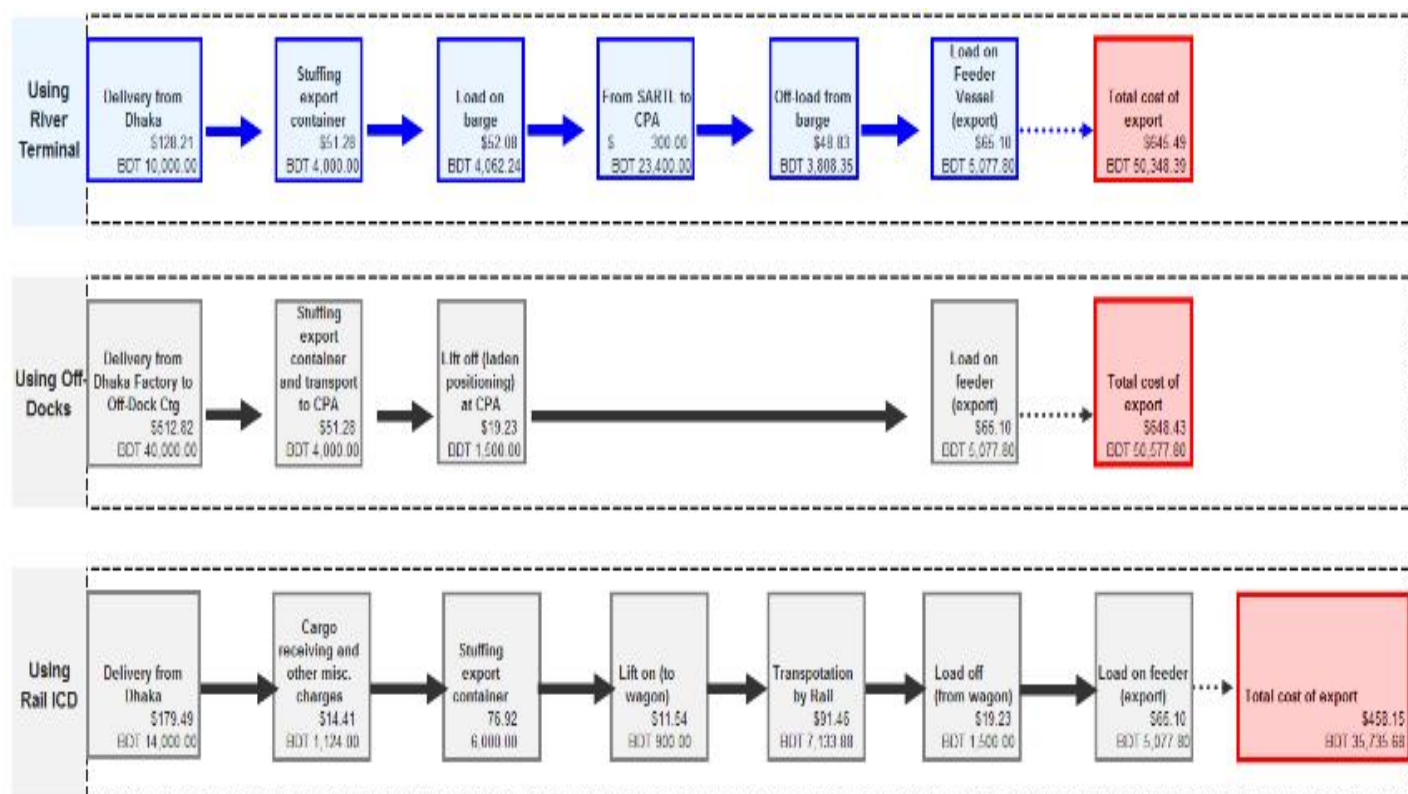


Figure 3.1: Cost Comparison (River vs Road and Rail)_for export (Source: Green Delta Capital)

The cost estimate shows that the Rail ICD is more cost effective. However, as the terminal is congested (long waiting times), the cargo owner will lose interest on working capital, as the container is 1 to 2 weeks longer standing idle.

Using the River Container Terminal will be slightly cheaper than using the Off Dock in Chittagong by road. However, planning will be easier with the River Container Terminal and dwell times will be reduced, if properly integrated in Custom ICT processes and planning systems of the shipping lines. More importantly, from Bangladesh point view, the unplanned delays now emerging in the road and train transports will be mitigated to a certain extent.

3.1.5 Project Location

The proposed river terminal will be located on a 14.5 acre plot of land on the northern bank of Dhaleshwary River. The plot is located in West Muktarpur Village of Panchasar Union under Munshiganj Sadar Upazila of Munshiganj district. The satellite map of the project site is shown in figure 3.2; the GPS coordinates of the plot is N 23°34'28" and E 90°30'43". The project area of 14.5 acres of land for the proposed project was bought from Holcim Cement who developed the land including raising it above the flood level earlier. The land for the proposed river terminal project at West Muktarpur has a number of advantages: it is fully owned by SAPL RT authority and therefore no land



Figure 3.2: Location of the proposed project site on a Satellite image

acquisition will be required; it is located in an industrial area; the land/ area is not prone to natural disasters like flood; the river at this location is wide and not prone to excessive erosion or siltation; and it has access to adequate water supply.

The land for the proposed river terminal project at West Muktarpur has a number of advantages: it is fully owned by SAPL RT authority and therefore no land acquisition will be required; it is located in an industrial area; the land/ area is not prone to natural disasters like flood; the river at this location is wide and not prone to excessive erosion or siltation; and it has access to adequate water supply.

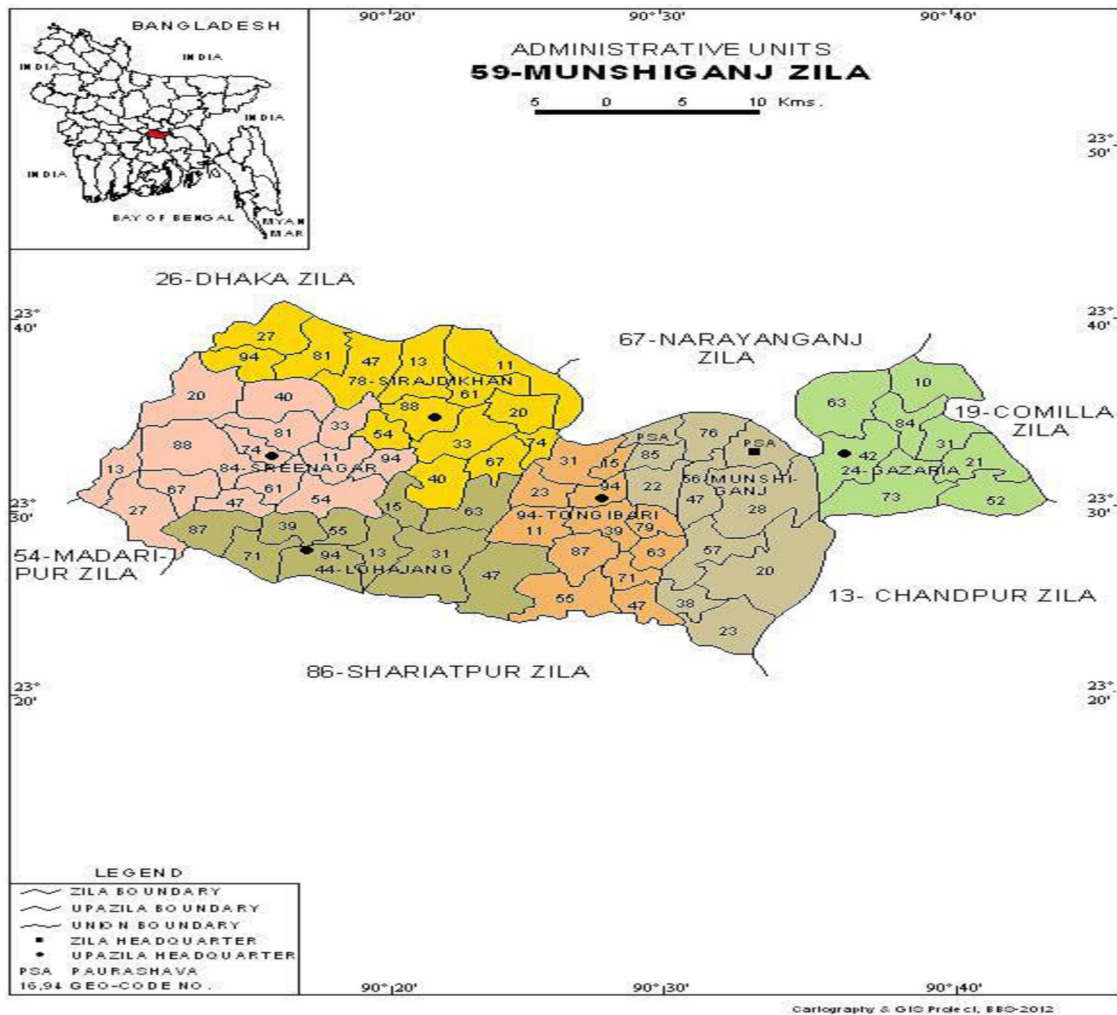


Fig: 3.3 Location of SAPLRT within Munshiganj Upazila



Fig: 3.4: Location of SAPLRT with respect to Bangladesh

3.1.6 Surrounding of the project:

1. East side : Mukterpur Bridge, Potato cold storage, riverside road, Muterpur police station and Emirate cement factory, Holsim cement factory
2. South side : Daleswary river, opposite to the riverside is Munshigonj town, auto rice mills and brickfield
3. North side : Ideal industries limited, open space, Mukterpur bridge, Akij Match Factory, Shah Cement factory and Garments, Sitalkkha River, Basundhara Cement factory
4. West Side : Settlement, Crown cement factory, potato processing industry, Toll Plaza of Mukterpur bridge, Ship Dockyard

In addition to these, different types of industries are present in this area and new industries are being set up. Among major industries, six cement factories, two textiles mills, two chemical factories, one match factory, four cold storages, and one paper mill have been identified. The major industries in the area include Asian Group of Industries (Asian Textile Mills; Ideal Textile Mills, Dewan Ice and Cold storage, Tongibari Cold Storage, Ali Cold Storage, Nishan Cold storage, Aman food industries (under construction), Shah Cement Factory, Emirates Cement Bangladesh Ltd., Metrocem Cement, Active Hime Chemical Industry, Akij Match Factory, and Madina Dying and Fabrics Ltd. BCAS team are working in the project site is shown under the following photos.



Photo 3.1 A: BCAS team working in the project site



Photo 3.1 B: Partial View of the port terminal

3.2 Project Layout

3.2.1 Pilled Structure

The deck of the piled structure is ca. 22 m wide, the berth length is 80 m and is designed to accommodate the operation of the quay even without the terminal area being ready. This follows the requirement to have the quay ready as soon as possible, before the Fixed Cargo Crane (FCC) will be delivered on site. Delivery of the two fixed cranes (phase 1) is foreseen on September 23rd at the port of Chittagong. After delivery it will take a couple of weeks to ship the cranes to SAPL's River Depot. A brief description of the piled structure is given below. Figure 3-5 shows an overview of the piled structure, Figure 3-7 shows a typical cross section of the piled structure.

- Piled Structure, deck ca. 80m length x 22m width, deck level +7.78m PWD;
- Total 72 bearing piles, 4 rows of piles. From river side to landside: dia 900mm, dia 800mm, dia 700mm and dia 700mm. Toe level of all piles at -35m PWD;

Two Fixed Cargo Cranes (FCC) incorporated in design, foundation consists of 9 bearing piles. Toe level of pile at -35m PWD;

- Bollards (15 ton in accordance to construction contract, 50 ton in accordance with drawings), 8 pieces, center to center 11m;

- Rubber fender SA 400H with separate horizontal fender system in front of the piled deck structure (steel frame of 'H' piles with wooden fender);
- At the rear side (land side) a retaining wall with run-on slab. Wall consists of reinforced concrete with horizontal PVC pipes to avoid large water pressures;
- There is no scour protection foreseen on the slope under the deck/piled structure. If in the future a lot of erosion occurs, the slope may need to be protected.

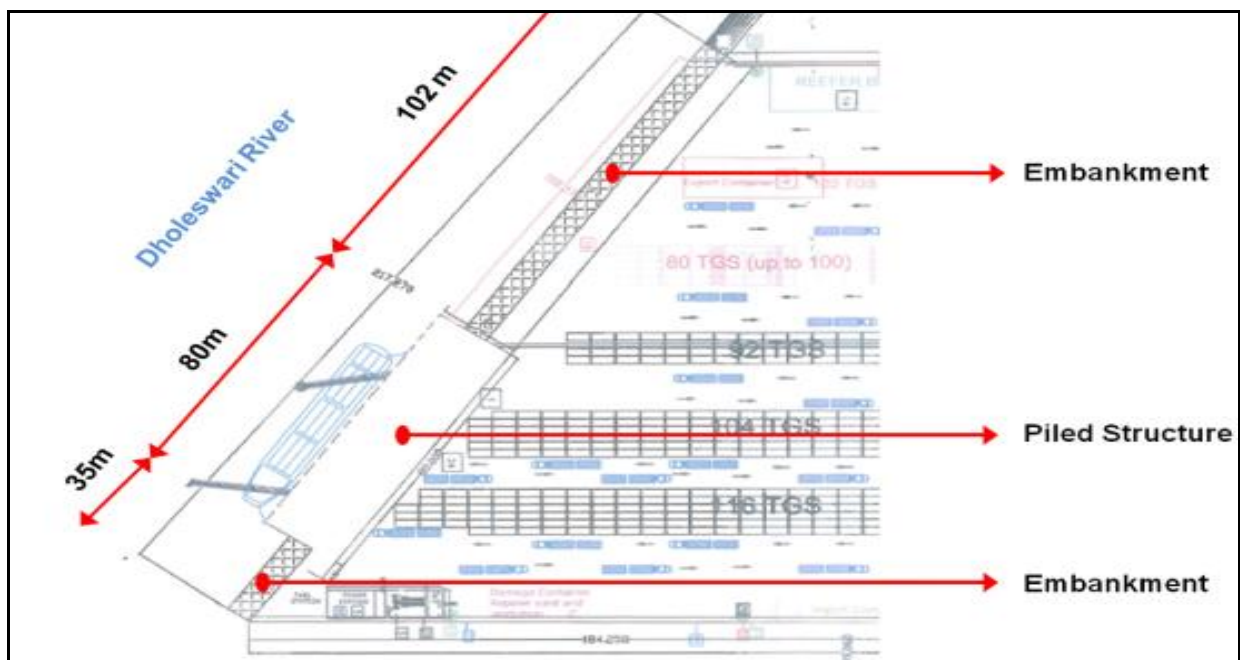


Fig. 3.5: Layout of piled structure and embankment (source: master plan layout 27-03-13)

In Dhaleshwary river Channel & Buriganga (upstream), there is no history of bank erosion / scour (under water) nor even significant as consulted from the final Design Report for inland container River Terminal, Pangaon. Dhaka in September 1995. There is a possibility of local scouring due to propellers revolution during vessels berthing and unberthing as well as waves from the playing vessels in the channel. Hence, in order to make the slope beneath the Deck Stable, after dredging of riverbed along the fender line up to – 5.0m PWD providing draft depth for the calling, vessel appropriate measures will

be taken. After every project component is completed or made operational, follow up / constant monitoring is mandatory & during monitoring if observed local scouring. SAPL has a contingency plan to provide boulder pitching or rip-raping with brick bats as done in different spots for the respective cement factories / other industries along the same river channel. SAPL has to maintain the natural condition of the slope after complete dredging during one rainy season making the slope vulnerable.

3.2.2 Embankment

There was no information available on the cross section drawing of the embankment. During the site visit to the ICT August 2014 it was observed that the embankment is covered with a layer of concrete and fortified with some stone boulders.

Figure 3.6 shows the situation of the embankment. At the rear side (land side) of the embankment structure the retaining wall is also incorporated in the design.



Figure 3.6 : Embankment structure (source: Photo site visit August 27, 2014)

The typical cross section and layout of the piles construction for the construction jetty is shown in Figure 3.7.

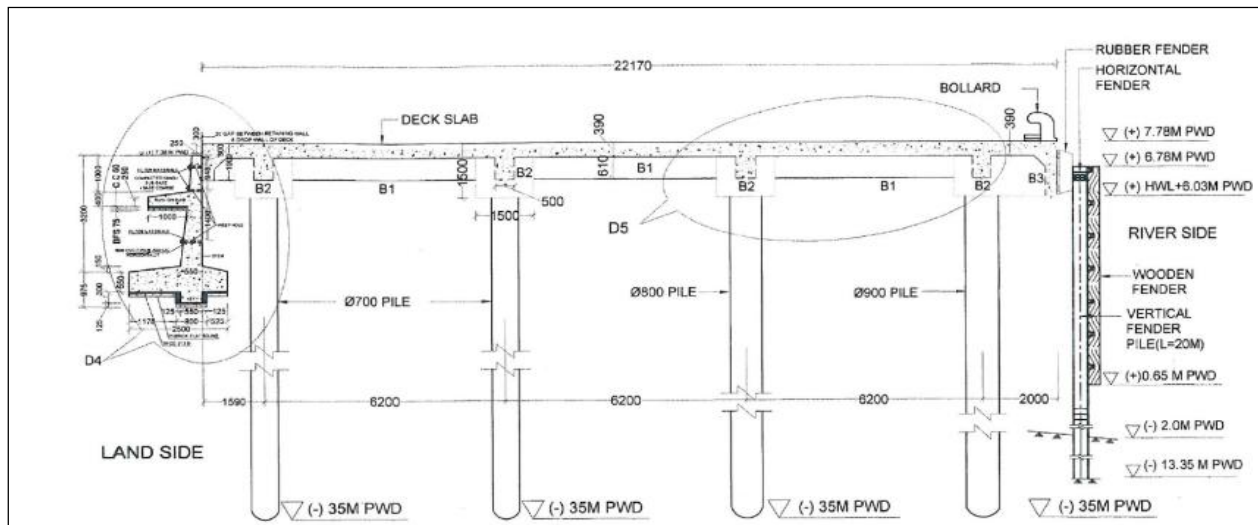


Figure 3.7: Typical cross section piles structure

3.2.3: Bathymetry Study

A Bathymetric study was under taken to assess the draft in the river across the jetty and along the approach of the vessels. The results shown in Fig 3.8 indicate that the draft remains adequate throughout the year for the container vessels to ply.

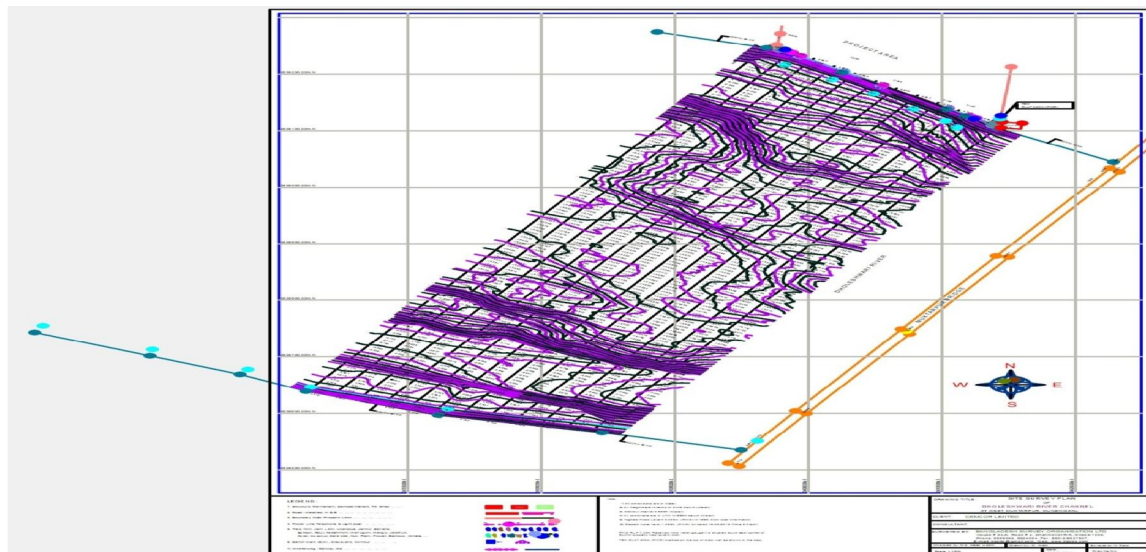


Fig 3.8: Bathymetric survey result at the project site (2014)

3.2.4 Master Layout Plan

SAPL has decided to use a FCC for the water side operations. The SAPL's Master Plan is shown in Figure 3.9 for Phase 1 with a quay structure of 80meters.

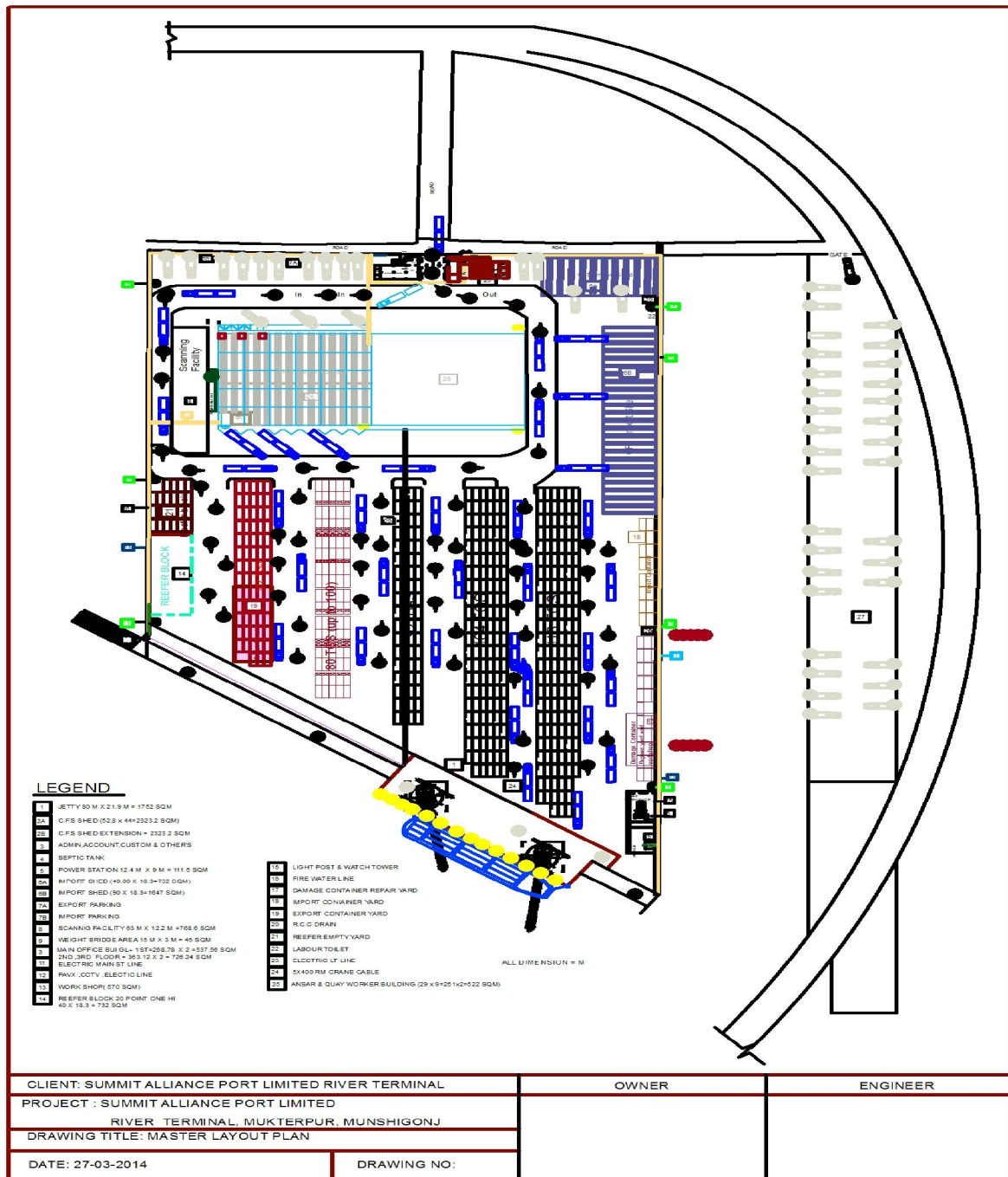


Fig 3.9: Master Layout Plan of SAPL

The storage yard is divided into separate stacks for export, import, reefers, empties, etc. The master plan drawing shows that the initial plan is to facilitate in 3 stacks of containers for import with a total of (116+104+92): 312 Terminal Ground Slots (TGS's) and facilitate in 1 stack for export containers up to 102 TGS. Additional to this there is 1 stack available for future development (up to 100 TGS's). At the North side of the stack the CFS is located.

3.2.5 Location of the Site & Surrounding Land

The proposed Summit Alliance Port Limited River Terminal(SAPLRT) will be set up at West Mukterpur, Munshigonj. The proposed project site is located at mouza of West Mukterpur, Union Panchaser, Upazilla: Munshigonj Sadar, Munshigonj. The proposed project would be set up in the land of SAPLRT purchased own land. The River Dhaleshwary, situated in the South side to the project. The location is well communicated by road and river ways. The site covers an area of 14.5 acres of land. The surrounding terrain is a low land seasonally flooded during rainy season. There are several industrial set up with 5 km radius. The entire area surrounding the project is almost rural and urban in nature.

3.2.6 River network between Chittagong and SAPL's River Container Depot in Dalesswari

The river port is situated at the Dholeswari River, approximately 30 kilometers south of Dhaka. The river is a tributary of the Meghna river system, which runs for 264 kilometers to the Bay of Bengal. The river has great depth and velocity. It is sometimes split up into several channels and sandbanks of its own formation. It is navigable, but dangerous, all year. At spring tide the sea rushes upriver reaching nearly 20 feet (6 meters). Furthermore, the river is very busy with hundreds of vessels sailing each day. The river has a least available draft of 3.5 meters, but improves to 4 meters where the river Meghna enters the Bay of Bengal. In practice most vessels schedule the sailing time during high tide between Chittagong and Dhaka. The draft is then sufficient for inland container vessels. The navigation routes describes the following figure 3.10

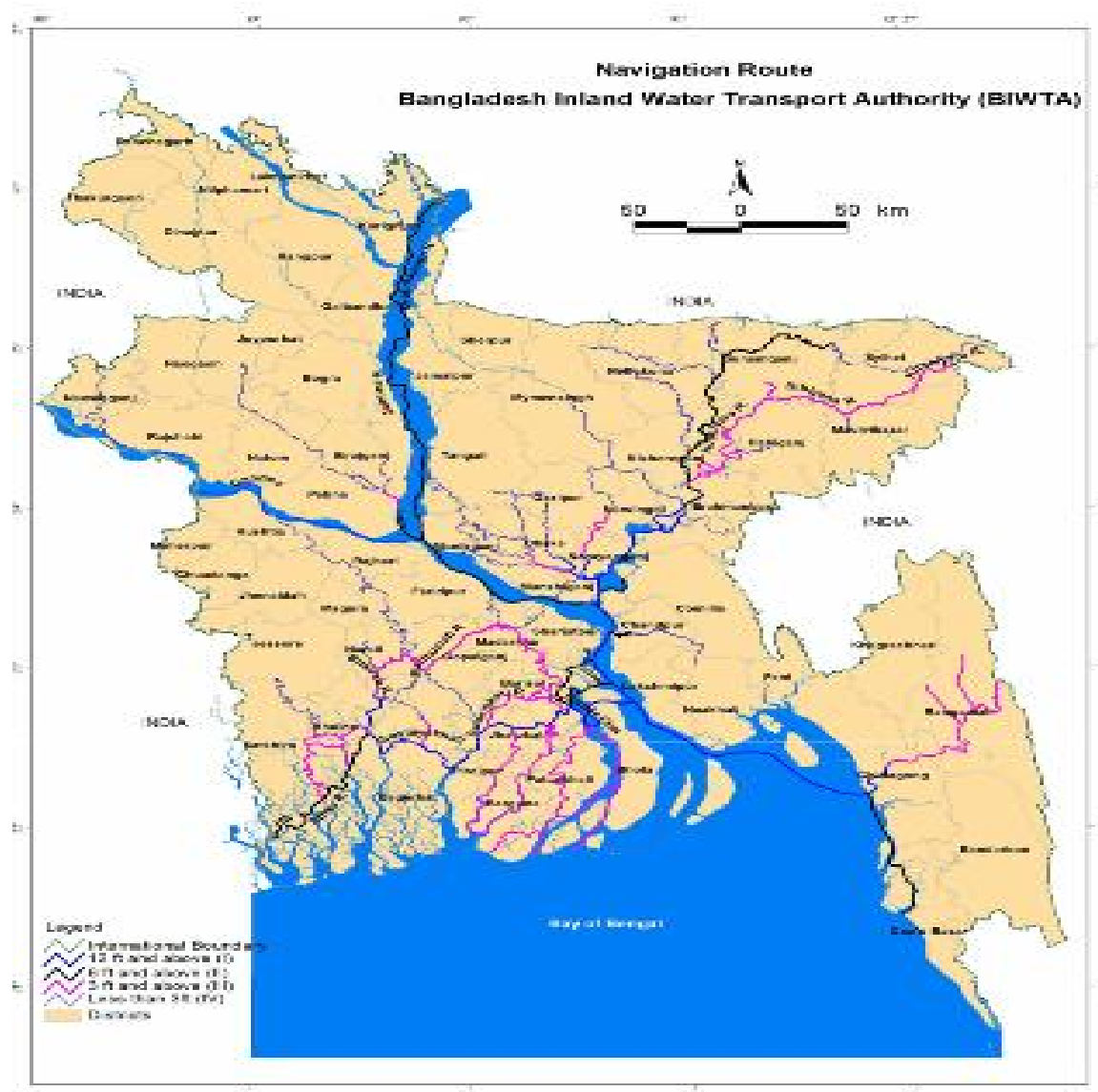


Fig 3.10: The navigation routes in Bangladesh (Source: BIWTA)

3.2.7: The Air Shed of the project area

The air shed for the project has been considered a radius of 5 kilometers. The impacts on environment and social issues this air shed will be considered. An air shed area of 5 kms radius of the project is showing in the following Map 3.11



Fig 3.11: Air shed area of 5 kms radius and 1 Km radius of the project is showing in the satellite image

3.3 Suitability of the site

While selecting a site for River Terminal container depot project, some aspects need to be considered. In the following section, the site of SAPLRT is evaluated based on these aspects:

Site preparation of SAPL would comprise the partial land filling and compaction in around 14.5 acres of land prior to construction a 1m thick carpet of crushed stone should be spread in the lay-down areas and on the working surface. All known underground services should be flagged up and all redundant services coming onto the site should be blanked off and removed.

3.3.1 Accessibility

Accessibility is an important parameter for a River Port Container Terminal. Such a project usually involves movement of heavy vehicles through the roads and river for container carrying Berge and ships for various purposes. The SAPLRT site has been found to have a satisfactory accessibility. Access to the site is by either the West Mukterpur to Dhaka or

Dhaka to West Mukterpur by road and Dhaka to Chittagong and Chittagong to Dhaka by River is easy. A 5 meter wide link road has connected the site with the Munshigonj - Nrayangonj district road.

3.3.2 Environmental considerations

All River Port Container Terminal design, regardless of the type of project, must be in accordance with the rules and regulations which have been established by the relevant national authority. SAPLRT is committed to comply with all applicable national and international standards. Moreover, the ambient condition of the site is suitable for the proposed Container Depot project. This has been discussed in the site alternative section.

3.3.3 Water supply

Water supply should be adequate to meet present and future project requirements. The supply may be available from a local municipal or privately owned system, or it may be necessary to utilize surface and sub-surface sources. To meet the required water demand, SAPLRT has already set up two deep tube-wells with a capacity of 2 m³/hour each and a water reservoir tank.

3.3.4 Drainage system

All sewage drainage should be taken to a septic tank. A septic tank is a long retention time tank where solids deposit out in an anaerobic bottom layer. The capacity of the septic tank is sufficient to cater for the normal

and incidental load arising from the container depot. The septic tank should be connected to a soak way by means of an overflow pipe whereby the liquid effluent can be drained.

On-site effluent disposal system is being installed to effectively treat and dispose of project effluents. Ultimately all effluents like wastewater treatment system (WTS) effluent, treated sewerage, oily drains, Ships flash water, and chemical spillage will be discharged in the

river after treatment in the wastewater treatment port. The photo is a part of drainage which is under construction.

It is recommended that the surface water and foul drainage systems should be separate and should be designed in accordance with BS EN 752 Parts 1 to 4 "Drain and sewer systems outside buildings". Manhole and chamber covers should be heavy duty throughout.



Photo 3.2: Drainage pattern

3.3.5 Transportation

The roads should be designed to be capable of carrying all the vehicles likely to be used during construction and throughout the life of the project including articulated vehicles and transporters used for the removal and replacement of major items of the project. Truck and Car parking and hard standing areas should be of similar construction to the roads. The road pavements should be of reinforced concrete and in conformity with relevant British or equivalent Bangladesh National Code of Practice.

3.3.6 Access Road to the project

Vehicular access to the project site will be provided by the development of a 750 m long access road to connect the main road of Munshigonj to Dhaka district highway. The access road is being funded by SAPL but the construction is being undertaken by Bangladesh Bridge Authority.

The route of the access road will be from the West boundary of the site and head westwards passing through connecting with the Dhaka –Munshigonj district road.

As detailed design of the infrastructure of the River port container terminal done by SAPLRT of the road will comprise a bitumen-paved road built to the following design criteria:

- Overall width shall be 6.3 m
- The elevation of the access road shall be at a minimum 1 meter
- Road lighting shall be required;
- Road markings and signs shall be provided in accordance with the requirements of Bangladesh Highways Authority and Local Government Engineering Department.

A security fence shall be provided along both sides of the access road. A partial view of the access road which will be used for the SAPLRT project purposes is seen in the 3.3



Photo 3.3 : 6.3 m wide and 750m long access road from the project site to district main road are constructing by the SAPLRT authority

3.3.7 Technology and Major Components of the Project

A range of highly specialized machineries and tools will be used for the operation of the river terminal and container freight station (CFS). These include Fixed Cargo Cranes (FCC), Reach Stackers, Forklifts, and other handling equipments. Container vessels will be used for transportation of containers between Dhaka and Chittagong.

Fixed Cargo Cranes (FCCs) are fitted on fixed pedestals on the quaysides and jetties (see Fig.3.12). The FCC cranes can be executed in various designs and are strategically positioned on quaysides for efficient loading and unloading of vessels.



Figure 3.12: Fixed Cargo Cranes (FCCs) will be fitted on fixed pedestals on the quaysides

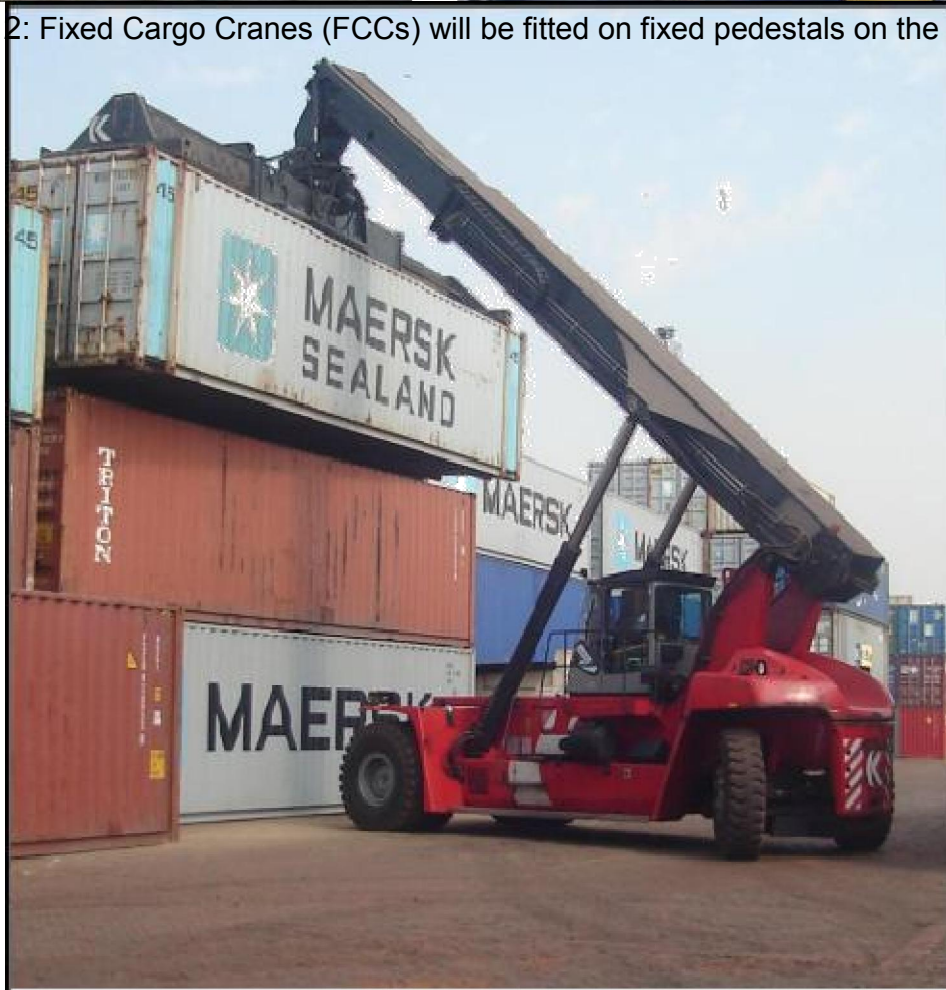


Fig. 3.13: Reach Stackers used for handling of containers

Reach Stackers are used for flexible handling of containers (Fig. 3.13) and are usually designed to lift containers as heavy as 45 metric tons into heights of six containers. Reach Stackers are able to transport a container over a short distance very quickly and pile those rows as required. Forklifts as shown in Fig. 3.14 are used to handle 20ft empty containers and for stuffing, unstuffing of palletize cargo, bales, bags, etc.

SAPL RT has employed Seaport Innovations, a Danish port operation consultancy firm, as consultant for matters related to procurement of equipment (SAPL RT, 2011). On recommendations of Seaport Innovations, SAPL RT has decided to procure FCCs from a company named Liebherr; other equipment and machineries (e.g., reach stacker, empty stacker) will be procured from a two companies named Kalmar and Fantuzzi. For barges/ vessels for carrying containers (see Fig. 3.14), SAPL RT has selected Ship broker Shipwright Bangladesh Limited; initially SAPL RT plans to procure four vessels.



Fig 3.14: Fork lifts

The following equipment will be used at the ICD during operational conditions. Table 3.2 includes the expected date of delivery of equipment.

Table 3-2: SAPL RT Equipment details

Name of Equipment	Manufacturer	Origin	Qty
Fixed Cargo Crane	Liebherr	Austria	2
Reach stackers	Kalmar	China	2
Fork-lift: 10 Ton diesel operated, High Mast	TCM	Japan	1
Fork-lift: 05 Ton Diesel operated, Low Mast	TCM	Japan	1
Fork-lift: 03 Ton Diesel operated, Low Mast	TCM	Japan	2
Fork-lift: 03 Ton Battery operated, Low Mast	TCM	Japan	1
Prime Mover	Ashok Leyland	India	5
Trailer	CIMC	China	10

3.3.8 Administration Buildings

The various buildings comprising the works should have a common architectural concept in order to unify the various elements and should be suitable for the operating and climatic conditions at site. The design should make selective use of materials to produce a pleasing concept throughout and a working environment, which is safe, durable and functional. The dimension of all the buildings should be such as to provide generous space for the safe installation and proper operation and maintenance of the port and its equipment. In particular generous space should be provided immediately in front of, behind and beside all items of the port.

In all rooms or buildings housing switchgear, a clear working space should be provided around switchboards of at least 1.0 m behind and in front of the fully withdrawn trucks.

It is recommend that the floors should be constructed in reinforced concrete and designed to accommodate all foreseeable static and dynamic loads. They should be provided with surface finish appropriate for their intended usage and properly drained bounded areas should be provided wherever necessary to contain accidental spillage of oil or other harmful liquids. The design of all buildings must ensure that noise, vibration and temperature levels are within permissible limit.

3.3.9 Sub-station

Transformer compounds should be constructed with oil containment facilities. Compounds should each be provided with suitable fencing and a lockable access gate. Fences to transformer compounds and other electrical areas within the site boundary should be of 5 m minimum height.

The containment tank should be fitted with a suitable overflow system, air vents, access hatches, ladders, a sump and a means of emptying the tank.

3.3.10 Site Fencing

A security fence should be provided around the permanent boundary of the site that should be 5 m high above the site formation level. Gates should be fabricated from galvanized steel and as a minimum provide the same level of security as the perimeter fence. All gates should be provided with suitable locking devices.

3.3.11: Some salient features of the Project site and its surroundings are shown in the following photos:



Photo 3.4: Green field

Photo 3.5: Jetty for container handling



Photo 3.6: Crown Cement factory adjacent to the project site

Chapter 4

DESCRIPTION OF BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

4.1 Project Site

One of the most important tasks of the ESIA was to assess the existing environmental conditions of the project site and its surrounding areas in order to establish a “baseline”, against which potential environmental and social impacts due to the implementation of the project would be predicted and assessed. In order to establish the baseline environment, detailed physical, ecological and socio-economic surveys have been carried out surrounding the project site. This chapter provides a description of the baseline physical, ecological and socio-economic condition of the project area and its surroundings

4.1.2 General Consideration

The main objective of examining the present environment is to provide an environmental baseline against which potential impacts from construction and operational phases of any project can be compared. A second important function of establishing a baseline for parameters such as air, soil and water quality is to ensure that any problems arising from existing sources are not erroneously attributed to the project under study. In the present study the different environmental components examined for setting baseline conditions of the project area, are physico-chemical, biological and socio-economical. In physico-chemical component, parameters included are land, water quality, air quality, climate, and noise.

4.2 Physical Environment

As part of the ESIA, detail field surveys have been carried out in areas (West Muktarpur and Chor Sayedpur) surrounding the project site. The survey data have been used to identify important physical installations surrounding the project site. In addition, traffic survey and condition survey of the road from Ponchoboti to Muktarpur Bridge have been carried out. This road will be used for transportation of cargo and containers to and from the proposed SAPLRT.

Water quality of Dhaleshwary River close to the riverbank at the proposed site has been assessed. Ambient air quality and noise level within the project site have also been measured in order to record existing conditions of the project site.

Analyses of these data and maps together with the nature of project activities provide useful insight into possible environmental impacts of the proposed project. This Section provides a description of the physical environment of the areas within and surrounding the project site; subsequently, the possible impacts of the proposed project activities have been evaluated against the baseline condition

4.2.1 Physical Environment Surrounding the Project Site

The proposed river terminal will be located on a 14.5 acre plot of land on the northern bank of Dhaleshwary River. The plot is located in West Muktarpur Village of Panchasar Union under Munshiganj Sadar Upazila of Munshiganj district. Figure 4.1 shows the proposed project site and broader areas surrounding the site, including the Dhaleshwary and Shitalakhya Rivers, on a Google image of the area; the GPS coordinates of the plot is N 23°34' 28" and E 90°30' 43". As shown in Fig. 4.1, the general area is a relatively narrow strip of land, which is bounded by Shitalakha River to the north and Dhaleshwary River to the south.

The two rivers meet and continue to the east as Dhaleshwary River. As a part of the baseline study, areas within about 3 km radius of the project site were surveyed in order to identify and record major physical features, e.g., location of human habitations, industries, markets, river, road network, other physical infrastructure the SAPL RT project site is

located on the northern bank of Dhaleshwary River, very close to the Muktarpur bridge; some land development has already been carried out at the project site, including construction of embankment along riverbank. The areas surrounding the project site are primarily industrial in nature. Ideal Textile Mills is located on the eastern side and a ship building yard is located on the western side of the project site.

At present, the project site is mostly vacant; there is a tin-shed office building on the northern side of the project site and recently constructed drainage channels runs through the project site along north-south direction. A relatively narrow approach road (about 6m wide) connects the project site with the Muktarpur bridge roads (Area to the east of the project site is known as West Muktarpur).

Different types of industries are present in this area and new industries are being set up. Among major industries, three cement factories, two textiles mills, two chemical factories, one match factory, four cold storages, and one paper mill have been identified. The major industries in the area include Asian Group of Industries. Ideal Textile Mills, Dewan Ice and Cold storage, Tongibari Cold Storage, Ali Cold Storage, Nishan Cold storage, Aman food industries (under construction), Shah Cement Factory, Emirates Cement Bangladesh Ltd., Metrocem Cement, Active Hime Chemical Industry, Akij Match Factory, and Madina Dying and Fabrics Ltd.

The village areas of West Muktarpur have tin shed houses; electricity and natural gas supply line are available in the area. Low-lying land near the village areas are used for agriculture. People living in the area primarily work in the surrounding industries. Two mosques and a primary school are located in this area

4.2.2 Bounding the Impact Area

The Map 4.1 shows the aerial view of study area. The River Dhaleshwari is situated in the South and east side adjacent to the project. For the ease of current ESIA study, the study area has been kept limited to the surrounding areas, which falls within the 3 Km radius of the proposed site



Map 4.1: Aerial view of study area

This almost covers the area falls under Munshigonj upazila of Munshigonj District. Primary and Secondary data has been generated and collected for conducting Baseline Study.

4.3 Climate

The climate of this region is tropical, with monsoons, characterized by a change of four seasons: pre-monsoon (March to May), monsoon (June to September), post-monsoon (October to November) and dry season (December to February). High air temperature is observed all throughout the year; daily air temperature variations are insignificant; air humidity is high with abounding rains. Typical parameters of the weather elements, as recorded for the period of last few years of observations (2003-2012) at Dhaka Meteorological Station 419230 (VG TJ) are presented in table 4.1 to 4.5 below.

4.3.1 Rainfall

The annual rainfall is about 2000mm and approximately 80% of it occurs during the monsoon. Average monthly rainfall during monsoon period varies between 300mm to 450mm. Maximum daily rainfalls during this period recorded in September 2007 is 668 mm.

The rainfall follows the general climate pattern with the highest rainfall in the summer month of June to September and minimum rainfall in the cooler and drier months of November to March. Table 4.1 presents average monthly rainfall for the period of last 67 years (1953-2009), average number of rainy days per month and average number of days per month when rainfall is greater than 10 mm. It is evident that extreme rainfall events occurred during the monsoon (June-September). Average monthly rainfall values for Dhaka area since 2006 are presented in Table -4.1.

Table - 4.1 Monthly Average Rainfall in the project area (2003- 2012)

Year	Rainfall in mm											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2012	10	1	37	269	137	175	226	-	-	-	-	-
2011	0	0	20	123	235	314	356	409	207	112	0	0
2010	0	48	22	37	177	308	167	340	169	174	0	81
2009	1	1	43	14	168	170	676	482	298	74	4	0
2008	23	56	45	91	205	577	563	319	279	227	0	0
2007	0	30	11	163	185	668	753	505	179	320	111	0
2006	0	0	0	181	185	326	331	167	663	61	5	0
2005	1	3	155	91	291	259	542	361	514	417	3	0
2004	0	0	9	167	162	476	295	191	839	208	0	0
2003	0	25	96	123	140	473	191	202	264	134	0	45

Source: BMD

4.3.2 Relative Humidity

As would be expected, relative humidity during the wet season is significantly higher than those occurring at other period of the year. This is well depicted by the data as shown in the Table - 4.2 for relative humidity of Dhaka during the period 2007–2012 (till May).

Table -4.2 Average Monthly Relative Humidity of the Project Area in last 6 years

Humidity in %	Monthly Mean Humidity												
Year	Jan.	Feb.	Mar	Apr.	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2007	68	68	54	69	70	81	84	80	80	78	77	78	73
2008	69	61	67	64	70	80	83	81	81	77	69	79	73
2009	72	55	53	66	72	74	80	82	81	73	66	69	70
2010	71	56	59	67	71	79	77	78	79	74	68	66	70
2011	69	54	57	64	76	80	79	82	77	73	67	73	70
2012	66	52	57	69	74	-	-	-	-	-	-	-	-

Source: BMD

4.3.3 Wind Speed

Monthly Prevailing Wind Speed and Direction in Knots of Dhaka for the period of 2007-2012 (till June) are presented in **Table - 4.3**.

Table - 4.3 Monthly Prevailing Wind Speed and Direction in Knots of Dhaka

Year	Month	wind Speed (Knots)	Wind Direction
2007	Jan	2.9	North-West
	Feb	3.1	North-West
	March	4.2	North-West
	April	3.8	South
	May	3.5	South
	June	3.1	South
	July	3.1	South
	Aug	3.1	South
	Sep	3.2	South
	Oct	4.1	North-East

	Nov	5.5	North-East
	Dec	2.9	North-West
2008	Jan	3.6	North
	Feb	3.2	North
	March	3.8	South
	April	3.4	South
	May	3.4	South
	June	3.3	South
	July	3.4	South
	Aug	2.8	South
	Sep	2.8	South
	Oct	9.6	North-East
	Nov	2.5	North-East
	Dec	3.3	West
2009	Jan	3.3	West
	Feb	4.1	West
	March	4.0	West
	April	4.1	South
	May	3.8	South
	June	3.1	South
	July	4.3	South-East
	Aug	2.8	South
	Sep	4.2	South-East
	Oct	2.3	East
	Nov	2.8	North
	Dec	2.4	North - West
2010	Jan	2.9	North - West
	Feb	3.3	West
	March	3.8	South
	April	4.1	South
	May	3.7	South
	June	3.0	South

	July	2.4	South
	Aug	2.2	South
	Sep	2.6	South-East
	Oct	2.0	North- East
	Nov	2.9	North
	Dec	2.4	North
2011	Jan	2.2	West
	Feb	2.4	West
	March	3.8	South
	April	2.4	South
	May	3.0	South
	June	2.7	South-East
	July	2.4	South-East
	Aug	2.4	South-East
	Sep	2.6	South-East
	Oct	2.0	North- West
	Nov	2.3	West
	Dec	2.1	North-West
2012	Jan	2.4	West
	Feb	3.0	West
	March	2.5	South
	April	2.6	South
	May	2.5	South
	June	3.0	South
	July	2.3	South-East
	Aug	2.5	South-East
	Sep	2.2	South-East
	Oct	2.1	North- West
	Nov	2.2	West
	Dec	2.3	South-East

Source: BMD

4.3.4 Wind roses for the proposed SAPLRT project area

A **wind rose** gives a very succinct but information-laden view of how wind speed and direction are typically distributed at a particular location. Presented in a circular format, the wind rose shows the frequency of winds blowing from particular directions. The length of each "spoke" around the circle is related to the frequency of time that the wind blows from a particular direction. Each concentric circle represents a different frequency, emanating from zero at the center to increasing frequencies at the outer circles. The wind roses shown here contain additional information, in that each spoke is broken down into discrete frequency categories that show the percentage of time that winds blow from a particular direction and at certain speed ranges. All wind roses shown here use 16 cardinal directions, such as north (N), NNE, NE, etc.

The wind roses for four different months are shown in the Figures 4.1 to Figure 4.2 for the months January, April, July and October.

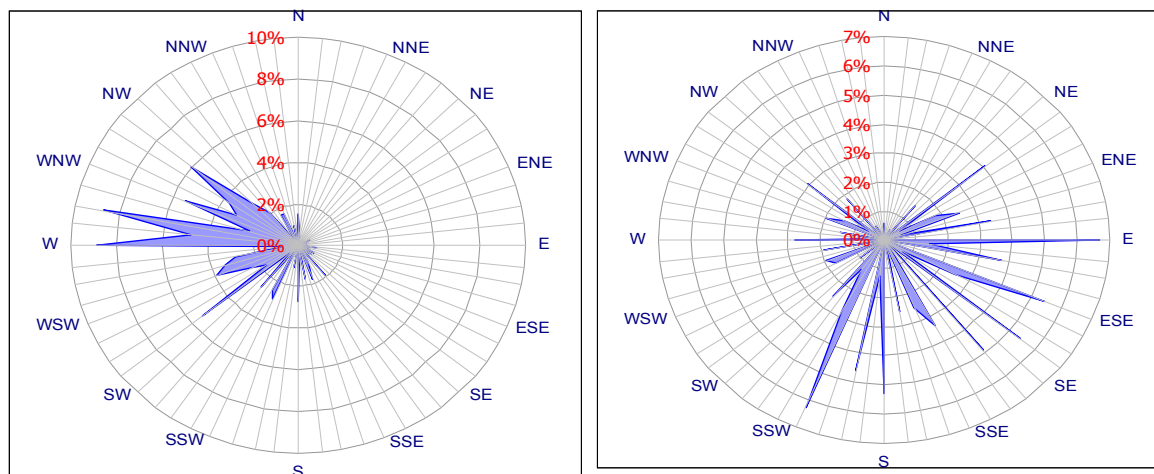


Figure 4.1: Wind rose diagram for the month of January-March and April-June 2012

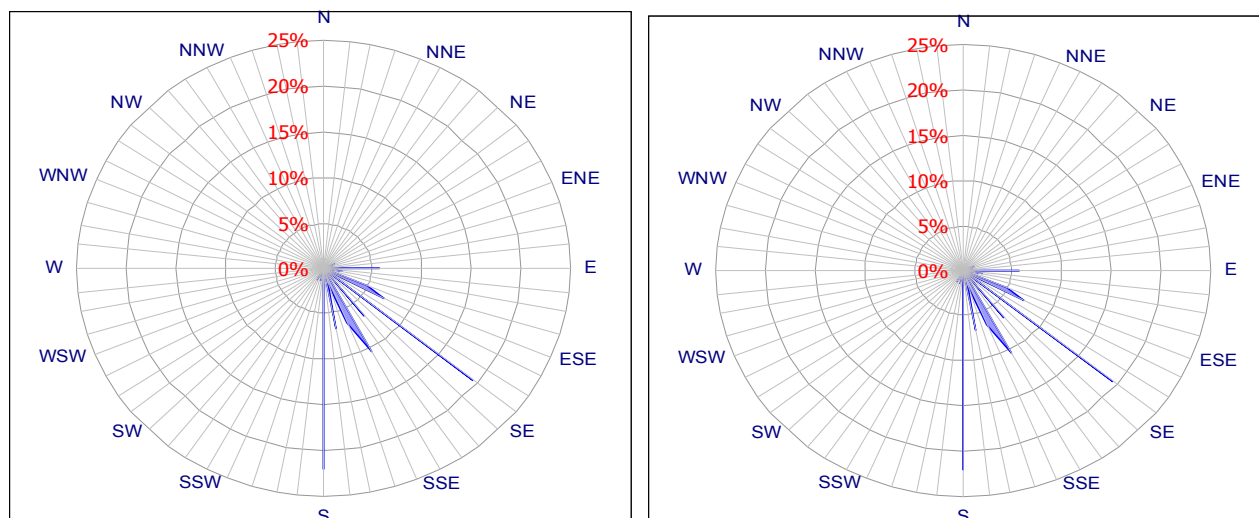


Figure 4.2: Wind rose diagram for the month of July-September and October-December 2012

The seasonal wind roses indicate shows that in Bangladesh the predominant wind direction are from North West in the winter months and from South West direction in the monsoon months. The prevalent wind directions will determine the location of air quality measurement points.

4.3.5 Ambient Air Temperature

The temperature of the country has the relationship with the period of rainfall. In general cool seasons coincide with the period of lowest rainfall. **Table 4.4 - Table 4.6** respectively shows the monthly average maximum and minimum temperature at Dhaka for the period 2007 -2012 (till March). During this period maximum average temperature of 39.6 degree Celsius was observed in April, 2009 where average minimum temperature was 8.2 degree Celsius in January, 2011. Rainfall pattern in the project area likely to be more or less similar that of Dhaka.

Table - 4.4 Monthly Ambient Temperature of the Project Area in 2004, 2005 and 2006

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	22.4	24.5	14.1
Feb	24.45	29.1	18.3
March	24.55	32.2	22.4
April	26.43	34.4	24.1
May	24.44	33.2	24.2
June	25.43	33.4	26.8
July	23.45	31.4	25.8
Aug	24.33	32	26.6
Sep	25.40	32.7	26
Oct	23.45	30.5	24.3
Nov	18.12	29	19.8
Dec	19.55	27	15.6

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	15.32	25.3	13.4
Feb	23.4	31.2	19.4
March	23.23	33.2	21.9
April	19.32	33.7	23.8
May	26.34	33.7	24.9
June	26.43	32.3	26.1
July	23.33	32.3	26.6
Aug	32.43	32.5	26.5
Sep	26.43	31.9	25.8
Oct	24.30	32.2	24.6
Nov	23.44	29.6	19.9
Dec	23.44	26.8	15.8

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	15.34	23.5	14
Feb	21.20	28.2	15.9
March	26.02	32.7	22.4
April	25.23	32.5	23.8
May	25.34	35.1	26.3
June	23.50	32.2	25
July	23.44	31.5	25.4
Aug	22.22	32.2	26.5
Sep	24.22	30.4	25.5
Oct	24.32	30.9	23.3
Nov	25.15	29.4	18.6
Dec	15.5	26.9	16.2

Table - 4.5 Monthly Ambient Temperature of the Project Area in 2007, 2008 and 2009

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	15.6	28.8	9.6
Feb	19.2	30.8	12.6
March	23.2	36.7	15.0
April	26.7	35.9	18.1
May	29.3	37.5	22.3
June	28.5	35.9	22.0
July	28.5	34.8	23.4
Aug	29.3	35.9	24.2
Sep	28.3	34.9	24.5
Oct	26.8	35.6	19.5
Nov	23.1	31.8	16.8
Dec	17.4	28.2	11.3

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	16.7	29.0	10.5
Feb	18.0	30.6	10.8
March	24.3	34.6	16.5
April	27.0	36.9	19.6
May	27.9	36.7	20.3
June	28.4	35.4	22.5
July	28.8	34.0	24.6
Aug	28.6	36.0	23.6
Sep	28.7	34.8	24.4
Oct	26.3	34.8	18.0
Nov	22.1	32.3	16.3
Dec	19.1	29.0	13.0

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	17.0	28.1	11.1
Feb	20.4	33.9	12.2
March	23.9	36.0	15.8
April	27.2	39.6	20.4
May	27.6	37.8	21.6
June	29.8	36.5	22.6
July	29.6	35.7	24.4
Aug	28.9	34.3	24.3
Sep	29.3	35.3	24.5
Oct	26.5	35.8	20.6
Nov	22.2	33.9	15.2
Dec	17.3	29.0	11.4

Table - 4.6 Monthly Ambient Temperature of the Project Area in 2010, 2011 and 2012

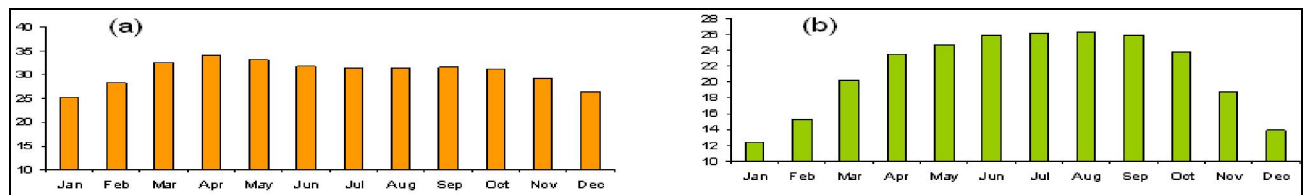
Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	14.5	29.0	9.6
Feb	19.8	34.2	12.0
March	25.6	37.3	18.4
April	28.3	37.9	20.8
May	28.8	36.9	21.3
June	28.8	35.8	23.2
July	29.6	35.1	25.3
Aug	29.5	35.1	25.0
Sep	28.8	34.0	24.8
Oct	26.9	35.7	21.5
Nov	23.1	33.2	16.6
Dec	17.8	29.7	11.0

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	14.2	27.8	8.2
Feb	19.8	31.0	13.0
March	24.0	34.5	16.0
April	26.4	35.8	20.2
May	27.6	35.3	21.3
June	29.1	36.0	23.2
July	29.2	35.4	23.9
Aug	29.0	35	24.5
Sep	29.0	36.2	23.7
Oct	27.4	34.5	22.0
Nov	21.9	32.4	17.2
Dec	16.8	30.0	11.0

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	15.5	28.5	10.5
Feb	19.2	33.0	12.2
March	23.4	37.3	18.3
April	26.2	35.2	20.2
May	27.3	35.3	21.3
June	29.2	36.0	23.2
July	29.1	35.4	23.4
Aug	29.1	35	24.3
Sep	29.3	36.2	23.7
Oct	27.2	34.5	22.0
Nov	21.3	32.4	17.4
Dec	16.4	30.0	11.2

Source: BMD

Characterization of air temperature in the project area is also made based on 8 years average air temperature which is presented in 2 graphical formats. Figure 4.3 (a) and 3(b) shows the mean monthly distribution of maximum and minimum temperature over Dhaka from 2004 to 2012, respectively.



Source BMD

Figure-4.3: Monthly (a) maximum and (b) minimum temperature (°C) of Dhaka based on observation (2004-2012).

The monthly average temperature variation in Dhaka division has remained largely uniform over the last 8 years. There have been hotter days in some years but it had negligible effect on the average the temperature over this period.

4.5 Air Quality

Air quality in the Dhaka City and its neighborhoods is deteriorating both from natural and manmade causes. It is one of the most dangerous and common kind of environmental pollution that is reported in most industrial towns and metropolitan city in Bangladesh. Major atmospheric pollution is caused by human induced activities like - burning fossil fuels, industrial processors, construction works and agriculture, transportation industry. In the rural areas however the ambient air quality is relatively good. It is assumed that accepting the small areas near the urban growth centre air quality in the most of the area would be far below the Environmental Quality Standards of Bangladesh. It is necessary for ESIA to establish the baseline air quality specially the PM concentration to determine the air shed of the project area.

BCAS has conducted a 24 hours continuous air quality monitoring for 5 days in the project area. The monitoring result of the air quality collected is shown in Table 4.9. It shows that the ambient air quality in terms of PM₁₀ and SPM is higher than the NAAQs level, NO_x and SO₂ are considered to quite good and still has reasonable buffer/assimilation capacity to absorb air pollutants to a certain extent. These are within the prescribed limit of the National Air quality Standards. The distances of measurements points from the centre of the project area is shown in Table 4.7 and Map 4.2. The measuring equipment used were high volume air quality analyzer for PM₁₀ and state of the art SO₂, NO₂ and CO analyzers.

Table - 4.7 Ambient Air Quality Analysis of the project area

SN	Description of data collection point			Ambient Air Pollution Concentration in			
		Distance from the centre	PM _{2.5} (µg/m3)	PM ₁₀ (µg/m3)	SO ₂ (µg/m3)	NO _x (µg/m3)	CO (mg/m3)
1	North side of the site (Date :27/8/2014) N 23° 34' 31.05'' E 90° 30' 40.85''	100m	46.2 (24 hours)	219.1 (24 hours)	13.6 (24 hours)	6.9 Annually	5.4 (8 hours)
2	West side of the site (Date :28/8/2014) N 23° 34' 30.58'' E 90° 30' 46.68''	150m	52.6 (24 hours)	251.3 (24 hours)	12.7 (24 hours)	6.6 Annually	4.7 (8 hours)
3	South side of the site (Date :29/8/2014) N 23° 34' 21.68'' E 90° 30' 45.95''	120m	41.4 (24 hours)	262.5 (24 hours)	15.8 (24 hours)	6.9 Annually	4.7 (8 hours)
4	East side of the site (Date :29/8/2014) N 23° 34' 22.54'' E 90° 30' 40.17''	185m	45.2 (24 hours)	273.5 (24 hours)	17.9 (24 hours)	6.8 Annually	5.1 (8 hours)
	Method of analysis		Gravimetr ic	Gravimetri c	West- Geake	Jacob and Hochheiser	Indicator Tube
	Test Duration (Hours)		24	24	Anually	Anually	24
	Bangladesh (DoE) Standard for ambient Air		65	150	365	100	10000
	WHO /World Bank Standard		25	50	20		NF
Remarks							
Pollution source from ongoing activities, the weather was sunny and the wind direction was from the north-west to south-east corner.							
(Source BCAS, sampling has been done by Respirable Dust Sampler & Fine particulate Sampler, Instrumex, manufacture by India, USEPA Certified).							
Note: 1. Fine Particulate Matter (PM _{2.5}). 2. Respirable Dust Content (PM10). 3. Suspended Particulate Matter (SPM). 4. Oxides of Nitrogen (NO _x).5. Sulphur Di-Oxide (SO ₂). 6. Carbone Mono-Oxide (CO).							



Map 4.2: Google image showing the points of AQM, Noise monitoring and water sample collection



Photo 4. 1: BCAS field representative collecting Air Quality data in the project site

4.6 Noise Level

As noted earlier, the proposed site of the river terminal is located on the northern bank of the river Dhaleshwari by the side of the Muktarpur Bridge on Dhaka -Munshiganj highway road. The site is surrounded by various types of industries, e.g., a textile mill on the Northern boundary, cement factory and plastic factory on the western boundary and a food processing industry on the access road. There is a small area of residential houses with a market and a mosque between the main road and the proposed site. There is heavy traffic flow through both the main road and the river way. The major noise sources at the project site as well as in the surrounding areas are:

- ✚ Transportation vehicles running through Dhaka -Munshiganj highway,
- ✚ Activities of the surrounding industries,
- ✚ Adjacent bustling bazaar, etc

On the other side of the river, the noise sources like rice mills and other industries are far away, and therefore, not affecting the noise environment at the proposed project site. The site is isolated from the surrounding neighborhood with a high boundary wall which is working as a noise barrier on three sides of the site. To establish the base level noise within and around the site, sound level was measured at different times and at different locations of the site and the approach road. The measurement points are shown in Map 4.2

Table 4.8 shows the maximum and minimum noise level at different location of sound monitoring in the project site at day time and Table 4.9 at night time, the acceptable Noise Level(Bangladesh gazette: September 7, 2006 is shown in Table 9.10. Figure 4.4 is sound level baseline map of the project area which shows that the sound level is higher than Bangladesh standards in the area between the proposed project area and the Dhaka-Mukhterpur road as the vehicular movement is high due to the high density of industries in the vicinity of the proposed SAPL project area. .

Table 4.8 : Measured Noise level at the project site in different locations at day

Date of survey	Time (Day)	Location# 1: Riverside of the port Date: 26.8.2014 Location Coordinated: N 23° 34' 31.12'' E 90° 30' 40''		Location # 2 : North side of the port Date: 27.8.2014 Location Coordinated: N 23° 34' 30.54'' E 90° 30' 47.75''	
		Max	Minimum	Max	Minimum
Day time	8.10am-9-10am	66	56	69	59
	9.15am-10.10am	62	55	68	58
	10.15am-11.10am	65	57	67	56
	11.15am-12.10am	61	56	66	57
	12.15am-1.10pm	66	52	65	55
	2.00pm-3.00pm	67	52	68	52
	3.00pm-4.00pm	68	53	69	53
	4.00pm-5.00pm	65	55	65	55
	5.00pm-6.00pm	68	52	68	54
Night time	6.00pm-7.00pm	65	53	63	52
	7.00pm-8.00pm	64	53	63	53
	8.00pm-9.00pm	55	54	54	53
	9.00pm-10.00pm	56	53	52	51
	10.00pm-11.00pm	56	54	56	54
	11.00pm-12.00pm	56	54	54	53
	12.00pm-1.00am	55	53	54	53
	1.00pm-2.00pm	54	53	54	53
	4.00pm-5.00pm	55	54	54	53

Table 4.9 : Average Noise level at the project site in different locations at night

Date of survey	Time (Day)	Location # 3: Gate side of the port Date: 28.8.2014 Location Coordinated: N 23° 34' 21.64'' E 90° 30' 44''		Location # 4: Central point of the port Date: 29.8.2014 Location Coordinated: N 23° 34' 22.58'' E 90° 30' 39.19''	
		Max	Minimum	Max	Minimum
Day time	8.10am-9-10am	71	66	68	66
	9.15am-10.10am	72	65	72	68
	10.15am-11.10am	65	57	71	66
	11.15am-12.10am	65	56	64	57
	12.15am-1.10pm	62	52	64	57
	2.00pm-3.00pm	68	52	66	58
	3.00pm-4.00pm	69	53	68	56
	4.00pm-5.00pm	67	55	66	57
	5.00pm-6.00pm	68	52	65	58
Night time	6.00pm-7.00pm	65	53	66	56
	7.00pm-8.00pm	62	53	64	57
	8.00pm-9.00pm	52	51	55	55
	9.00pm-10.00pm	53	52	56	54
	10.00pm-11.00pm	53	52	56	53
	11.00pm-12.00pm	55	54	55	54
	12.00pm-1.00am	57	57	56	52
	1.00pm-2.00pm	58	58	54	52
	4.00pm-5.00pm	59	59	58	53

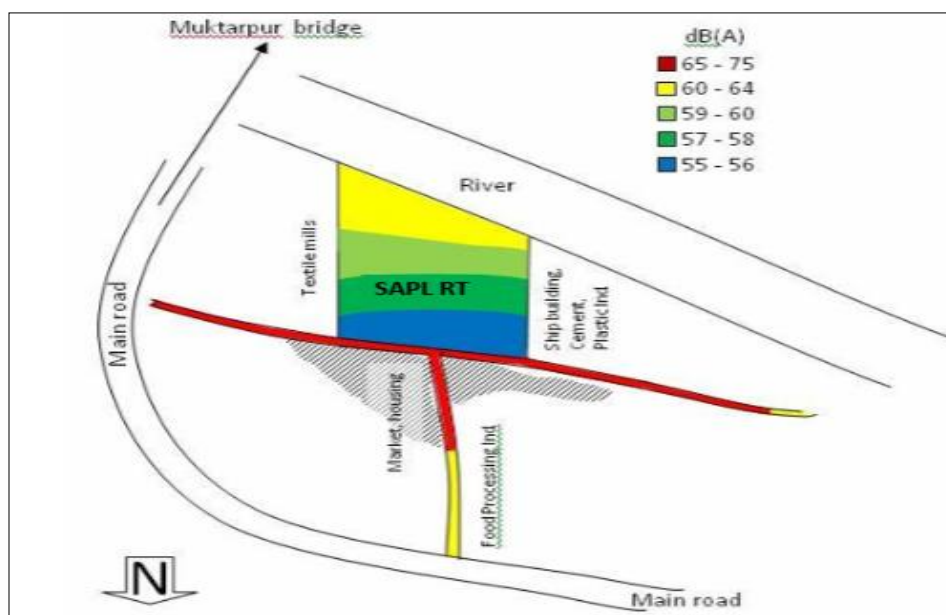


Figure 4.4: Base noise level mapping at the site and the neighboring service road

Table 4.10 : Acceptable Noise Level(Bangladesh gazette: September 7, 2006

Type of Area	Description of Area	Noise Level, dB(A) L_{eq}	
		Day time (6AM – 9PM)	Night time (9PM – 6AM)
Silent zone	Hospitals, schools, offices, etc.	50	40
Residential zone	Family housing quarters	55	45
Mixed zone	Mixed residential, industrial, etc.	60	50
Commercial zone	Markets, shops, business offices, etc.	70	60
Industrial zone	One or more factories, industries, etc.	75	70

Table 4.11: Standards of noise level of DoE, GOB and WB

Standard	Zone	Day time dBA	Night time dBA
World Bank EHS Guideline 2007	Residential, institutional, educational	55	45
	Industrial, commercial	70	70
Bangladesh ECR, 1997	Mixed area	60	50
	Commercial	70	60
	Industrial	75	70

It is evident that other than in early morning, the noise level in the neighborhood of the project site (mixed industrial-cum-commercial area) is higher than that inside the site. The noise comes from the neighboring industries, traffic through main road, loud speakers, cassette players, human gathering, activities in small factories and the bazaar on the street side, etc. Table 4.11 shows the acceptable noise level as per Bangladesh gazette: September 7, 2006.

According to the gazette notification, the proposed port site, at current condition, may be characterized as an industrial zone. The ongoing developments in the zone around the site will ultimately turn the area to a full-fledged industrial zone. Although the noise level within the project site appears to be within the acceptable limit prescribed by the Department of Environment for industrial area, the noise level in the neighborhood of the site is relatively higher than the limits.

4.7 Traffic situation

The roadway from Ponchoboti (Narayanganj) to West Muktarpur (Munshiganj) is very important for maintaining vital communication between Dhaka and the industrial areas of Narayanganj as well as parts of Munshiganj. It also supports the densely populated residential and commercial areas of Narayanganj. The roadway is 2 lane undivided and without any geometric treatment. Observation on geometric and operational conditions of the roadway shows that the corridor suffers from uncontrolled movements of pedestrians, non- motorized and motorized vehicles.

As a part of baseline study, traffic data were collected from on-spot surveys at key location of West Muktarpur roadway during September 2014, on a weekday (Thursday) during peak traffic hours shown in Table: 4.12 and 4.13 for daytime and night respectively. During the survey both number and type of traffic along the roadway were recorded; however, origin-destination survey was not conducted. The survey was carried out for 24 hours. In general traffic along the roadway is dominated by NMT (non-motorized transport) and 3-wheelers. Other important vehicle types include mini-bus, trucks, pick-ups, motor cycle and freight vehicles shown in Fig 4.5 and Fig. 4.6

Table: 4.12 shows traffic composition by vehicle type at the Munshigonj- Dhaka road
(6.00am- 6.00pm) : Day Time Data

Vehicle name	6-7 am	7-8 am	8-9 am	9-10 am	10-11 am	11-12 am	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	Total
Bus, Minibus	1	2	4	12	12	9	10	8	6	9	13	12	98
Truck, pickup	14	10	8	14	16	16	13	13	11	21	27	33	196
Three wheeler	28	42	48	62	102	140	132	107	90	67	153	138	1109
Car,Jeep,Taxi, Micro	0	0	2	4	6	9	3	7	5	10	9	16	71
Freight Vehicle	3	1	0	2	1	5	3	4	2	1	11	3	36
Motor Cycle	12	22	32	38	31	29	42	33	17	19	37	10	322
NMT	4	5	6	3	6	7	8	9	6	7	5	6	72
Others	2	3	2	1	2	1	2	3	1	1	1	2	21

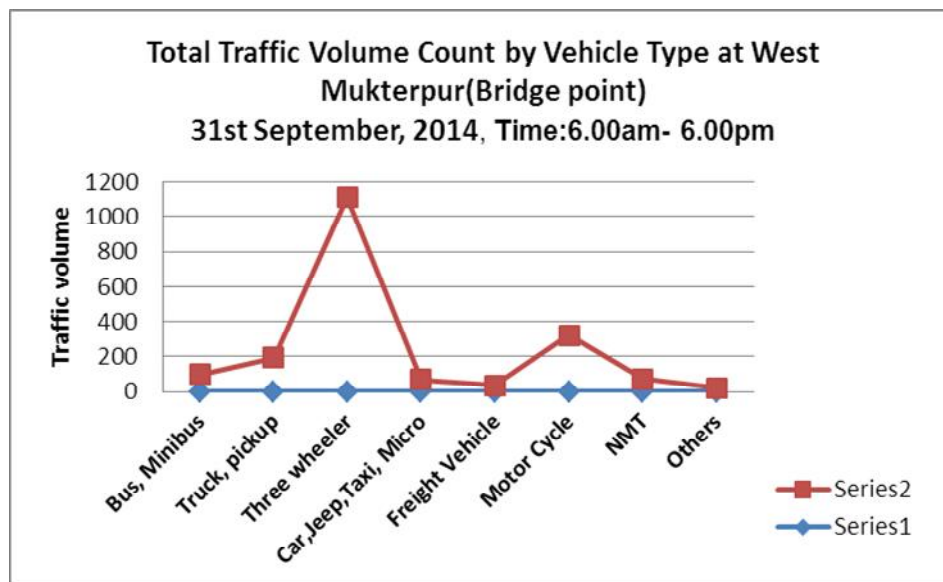


Figure 4.5: Traffic volume counted by BCAS representative at the project site

Table: 4. 13 shows traffic composition by vehicle type at the survey spot of Munshigonj- Dhaka (6.00pm- 6.00am): Night Time Data

Vehicle name	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm	11-12 pm	12-1 am	1-2 am	2-3 am	3-4 am	4-5 am	5-6 am	Total
Bus, Minibus	13	16	9	10	7	6	3	4	0	0	0	2	70

Truck, pickup	12	17	48	42	50	48	52	32	24	12	7	9	353
Three wheeler	190	170	120	102	70	52	43	17	20	9	2	28	823
Car, Jeep, Taxi, Micro	9	7	12	11	4	2	1	0	0	0	1	2	49
Freight Vehicle	4	6	2	4	3	9	6	7	2	0	1	2	46
Motor Cycle	45	62	22	42	12	13	16	4	5	4	2	4	231
NMT	6	7	5	3	4	6	7	4	7	8	9	7	73
Others	4	5	6	1	2	4	4	5	3	4	4	3	45

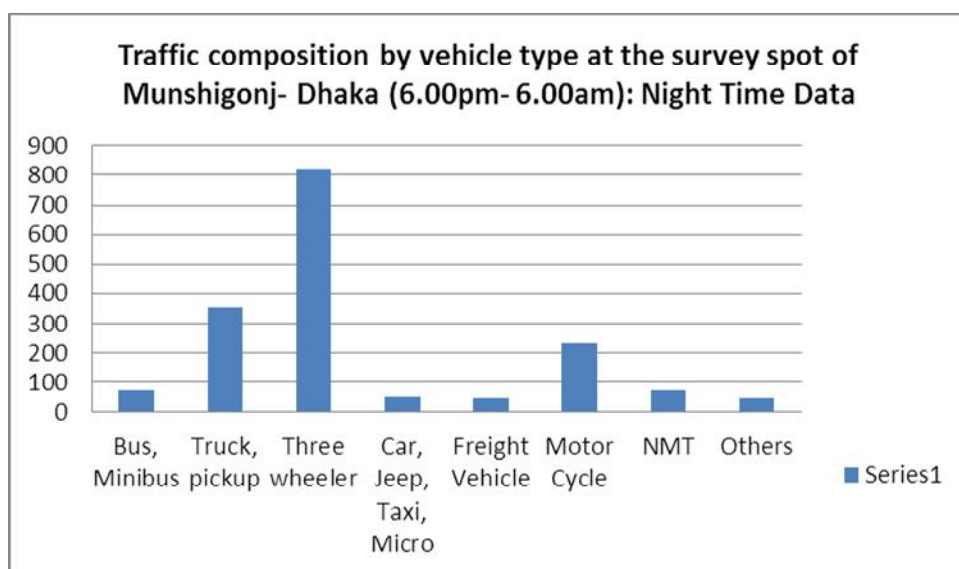


Fig. 4.6: Road Traffic counted by Vehicle type at night

4.7.1 River Traffic of Dalesswary

As Bangladesh is a riverine country, river transport is the most popular and common mode of transport. The navigable waterways of the Dalleswari and Meghna river system vary between approximately 3,372 km during the monsoon to approximately 1,200 km during the dry season. Inland transport is mainly operated by the Bangladesh Inland Water Transport Corporation (BIWTC), which operates the large car, ferries, launches and steamers.

There are seasonal difficulties in the navigability of rivers and canals for the traditional country boats that constitute the great bulk of the merchant fleet, but geography and history have made these craft the preferred means of moving goods between the ports on the Bay of Bengal and the interior of the country.

The Dalleswari River, which forms the Southern boundary of the project site, is one of the major waterways in the southern region of Bangladesh. Different kinds and sizes of boats, launches, ships and ferries are active in transporting people, goods, buses and trucks to both sides of the River.

A traffic was undertaken between 6am to 6pm on August 2014 and the results are present in Table 4.14a and 14b. Around 1224 motorized and non-motorized river vehicles cross the river in both direction 6am and 6pm. The survey was undertaken during daylight and night hours. This estimate was made based on the direct and indirect employments due to the economic activities. Most of the boats and loaders pass the Sitalakkha and Daleswari conjunction point during day time.

As mentioned earlier that the port is going to establish on the bank of the river Daleswary which is closed to the Mukterpur bridge. This is a very important place for river vassal movement to and from the country. A lot of industry has been set up based on the river. The volume of river vehicle movement will be high when the Pangaon container terminal will go in operation. BCAS team conduct a river traffic survey during August 2014 on the proposed project site. The result of the survey is given below:

Table 4.14 a: Daleswari River Traffic survey, August 2014(Day time)

River Vehicle Type	6-7 am	7-8 am	8-9 am	9-10 am	10-11 am	11-12 am	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	Total
Sand Loader	51	72	64	62	72	63	67	55	44	64	53	62	729
Launch	14	13	8	11	11	6	3	3	1	2	2	3	77
Fishing boat	2	4	4	2	2	1	2	1	1	2	1	2	24
Small ship	1	2	2	4	2	1	2	3	2	3	1	1	24

Engine boat	3	1	2	2	1	5	3	4	2	1	1	3	28
Others	2	2	3	3	3	2	4	3	1	1	3	1	28
Total	73	94	83	84	91	78	81	69	51	73	61	72	910

Source: BCAS field study (31st August 2014)

Table 4.14 b: Daleswari River Traffic survey, August 2014(Night time)

Vehicle name	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm	11-12 pm	12-1 am	1-2 am	2-3 am	3-4 am	4-5 am	5-6 am	Total
Sand Loader	32	21	22	5	1	2	3	4	2	3	4	12	111
Launch	2	7	28	22	11	3	0	0	0	4	7	9	93
Fishing boat	11	1	1	1	1	2	2	2	0	0	0	0	21
Small ship	1	2	1	1	4	2	1	1	2	2	1	2	20
Engine boat	14	6	2	0	0	0	0	0	0	0	0	2	24
Others	4	5	6	1	2	4	4	5	3	4	4	3	45
Total	64	42	60	30	19	13	10	12	7	13	16	28	314

Source: BCAS field study (31st August 2014)

4.8 Water Quality

The Dhaleshwari river water in the immediate vicinity of the project site contains elevated concentration of a number of pollutants that most likely come both from domestic and industrial sources. Wastewater discharging into the Dhaleshwari River from a textile mill on the eastern boundary of the project site was found to contain high concentrations of Ammonia, BOD5 and COD.

4.8.1 Surface Water Quality

The Dhaleshwari River is the only surface water body adjacent to the project site. The river carries run-off water from adjoining areas, which might contain some pollutants. Water was collected from the river and analyzed in AECL Laboratory. Table 4.16 shows the characteristics of the river water samples. It shows that the river water samples contain very high concentrations of TC (total coliform) and FC (fecal coliform), indicating pollution from domestic sewage. The water samples also contain relatively high concentration of sulfate, possibly from surrounding industrial sources. Elevated Lead (Pb) concentration, exceeding WHO health-based drinking water guideline (0.01 mg/l), has been detected in both water samples. Industrial sources are likely to be responsible for elevated Lead concentration in the river water. The following Table 4.15 shows the water quality of the Daleswary River:

Table-4.15: Surface Water quality (limited parameters) of the Dhaleshwari River

Parameter	Unit	Concentration	
		Sample 1	Sample 2
pH	--	6.21	6.16
Turbidity	NTU	32.5	32.2
Color	Pt.-Co.	56	69
Electrical Conductivity (EC)	S/cm	148	144
Total Dissolved Solids (TDS)	mg/l	104	109
Total Suspended Solids (TSS)	mg/l	34	30
Total Ammonia as NH ₃	mg/l	0.485	0.517
Sulfate	mg/l	17.7	16.2
Sulfide	mg/l	0.004	0.009
Phosphate	mg/l	0.127	0.118
Nitrate	mg/l	0.7	0.5
Nitrite	mg/l	0.045	0.067
Lead (Pb)	mg/l	0.048	0.032

Cadmium (Cd)	mg/l	0.001	0.001
Chromium (Cr)	mg/l	0.013	0.003
BOD ₅	mg/l	1.4	1.4
COD	mg/l	6	8
Total Coliform (TC)	cfu/100 ml	7,650	2,350
Fecal Coliform (FC)	cfu/100 ml	4,050	1,650

Source: AECL Lab (sample collected on 25.08. 2014 and reporting on 06.09. 2014)

Wastewater samples discharging into the Dhaleshwary River from an adjacent textile mill was collected and analyzed for selected parameters including pH, Ammonia, EC, BOD₅ and COD. Table 4.16 shows characteristics of the effluent sample. It shows that the effluent contains high concentrations of Ammonia (43.8 mg/l), BOD₅ (112 mg/l) and COD (355 mg/l). Thus, effluent from the textile mill is a major source of pollution of river water close to the proposed project site.

Table 4.16: Characteristics of effluent from a nearby Textile Mill

Parameter	Unit	Concentration Present
pH	--	10.5
Electrical Conductivity (EC)	□S/cm	1901
Total Ammonia as NH ₃	mg/l	43.8
BOD ₅	mg/l	112
COD	mg/l	355

4.8.2 Ground Water

Ground water level exists at a moderate (Generally below 8.0 m) depth, which is being recharged mainly by infiltration of rainwater. The ground water zoning map is shown in fig 4. 5. Ground water is the source of water for potable water in the project. To determine quality of ground water, one sample was collected from the tube well of the project and

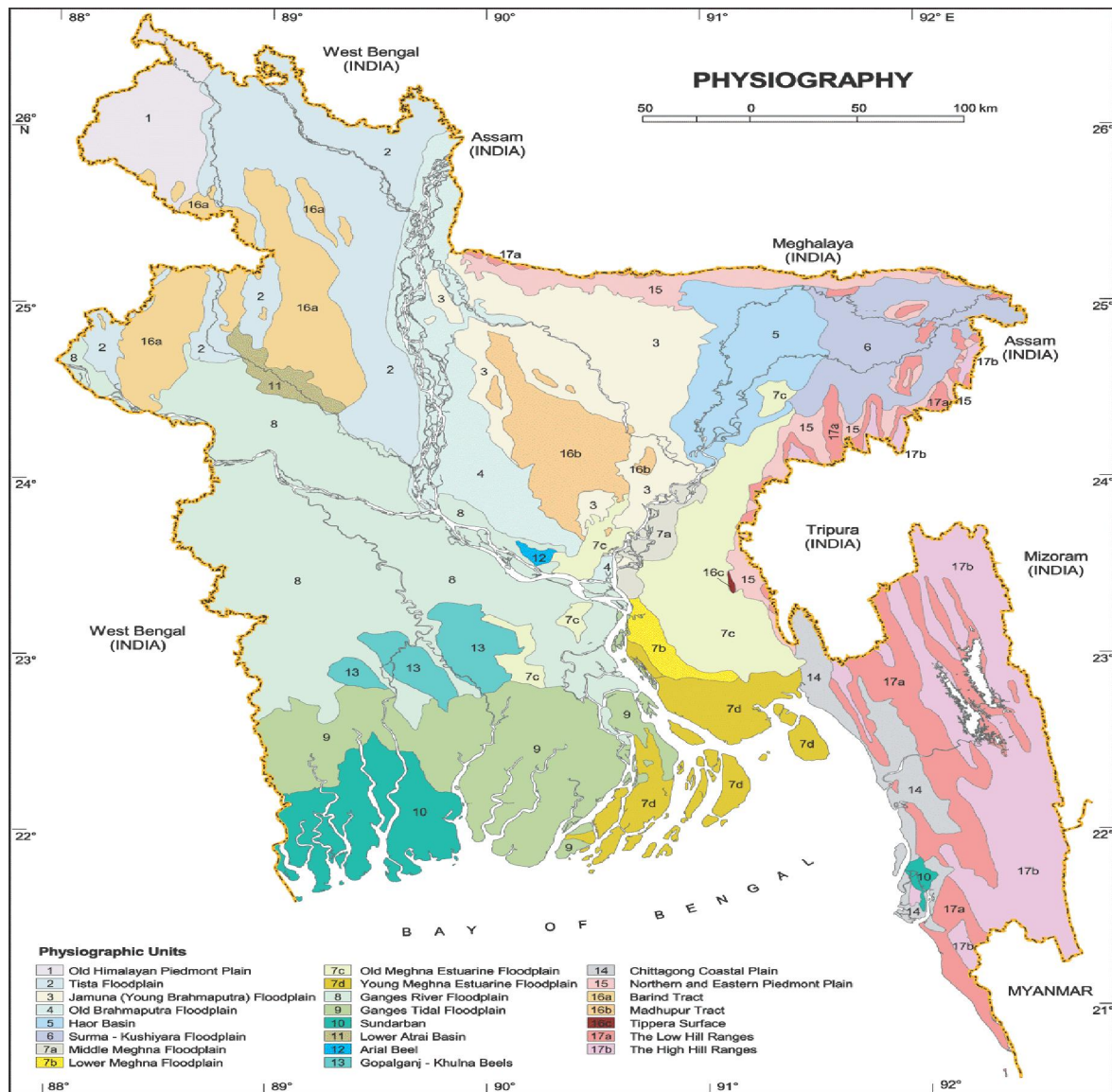
analyzed for different parameters. The results shows that all the parameters remain within the allowable limit of drinking water value as per as Environmental Quality Standards for Bangladesh. The parameters which have been analyzed during this study are presented below in Table 4.17

Table 4.17: Ground water quality (limited parameters) from deep tube well

Parameter	Units	Value	Bangladesh Standard For Inland Surface Water
pH at 26.9°C	mg/L	7.1	6.0 - 9.0
TDS	mg/L	90.0	1000
Iron	mg/L	0.8	(0.3 – 1.0)
Alkalinity	mg/L	78.0	-
Hardness	mg/L	68.0	(200 – 500)
Chloride	mg/L	16.4	(150 – 600)
TSS	mg/L	4.8	10
COD	mg/L	11.7	NS
BOD	mg/L	5.5	NS
Arsenic	mg/L	0.050	0.05
Conductivity	μS/cm	696	NS

Source: AECL Lab (sample collected on 25.08. 2014 and reporting on 06. 09. 2014)

Most of the area of Bangladesh is a vast, low-lying alluvial plain, sloping gently to the south and southeast. According to Bangladesh Agricultural research council's Agro-Ecological Zoning map of Bangladesh, the proposed project area falls in the Young Brahmaputra - Jamuna Floodplain. This region comprises of the area of Brahmaputra sediments. It has a complex relief of broad and narrow ridges, inter-ridge depressions, partially in filled cut-off channels and basins. The following Physiographic Map 4.3 shows the soil type of Bangladesh.



Source: Modified From SRDI, 1997; Rashid, 1991; Reimann, 1993

Map 4.3: Physiographic Map of Bangladesh

This area is occupied by permeable silt loam to silty clay loam soils on the ridges and impermeable clays in the basins which are neutral to slightly acidic in reaction. General soil types include predominantly Grey Floodplain soils. Organic matter content is low in ridges and moderate in basins. The physiographic map of Bangladesh is shown in Map 4.3. Within this area, elevations are less than 7.276m above sea level, which is shown in Figure 4.10.

4.9 Topography of the Project Site

The topography of the project site is shown in Figures 4.7a- 4.7e. The project site is approximately 7.0 m above sea level as shown in Fig 4.8. The project site was raised by 1m ensuring that that level is above the highest flood levels as recorded in 1998.

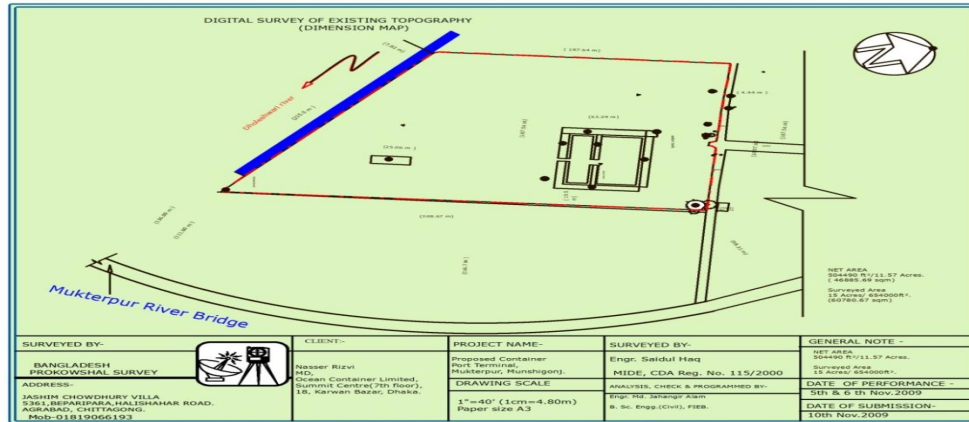


Figure 4.7a: Digital survey of existing Topography (Dimension Map)

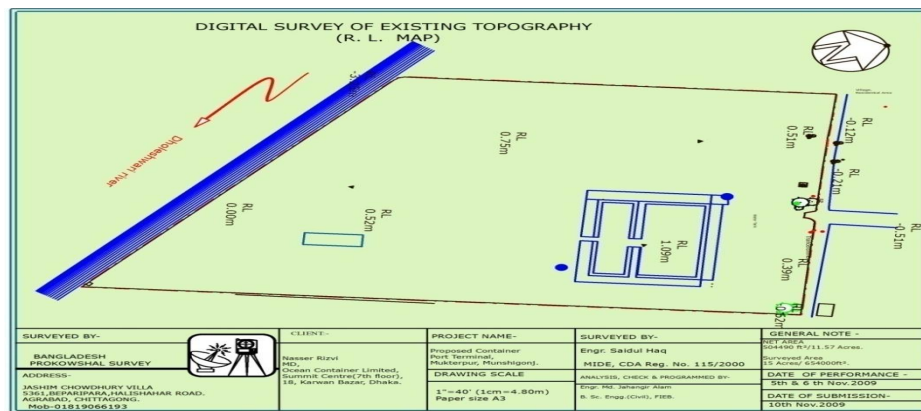


Figure 4.7b: Digital survey of existing Topography (R.L Map)

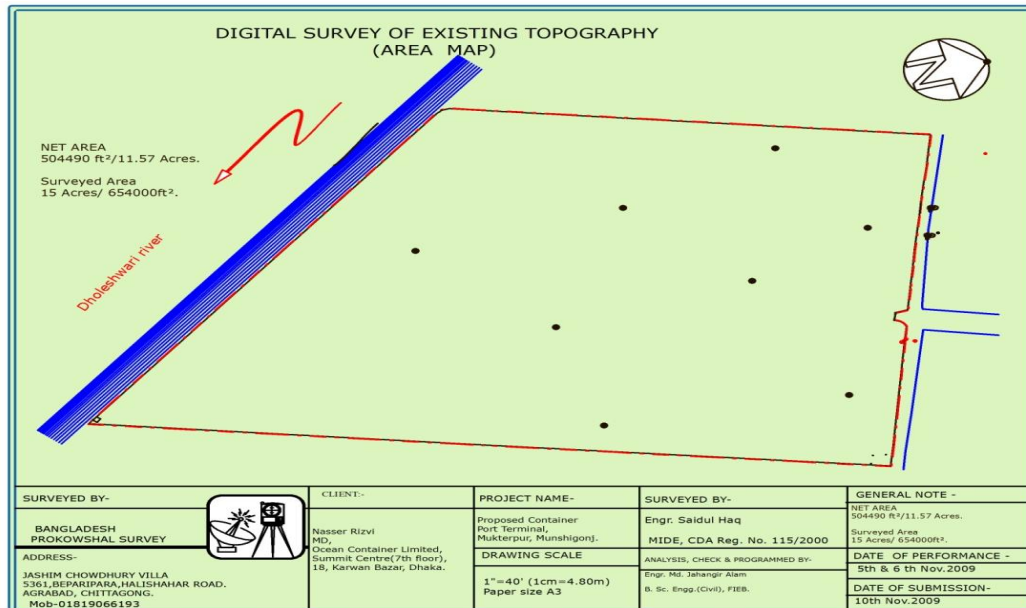


Figure 4.7c: Digital survey of existing Topography (Area Map)

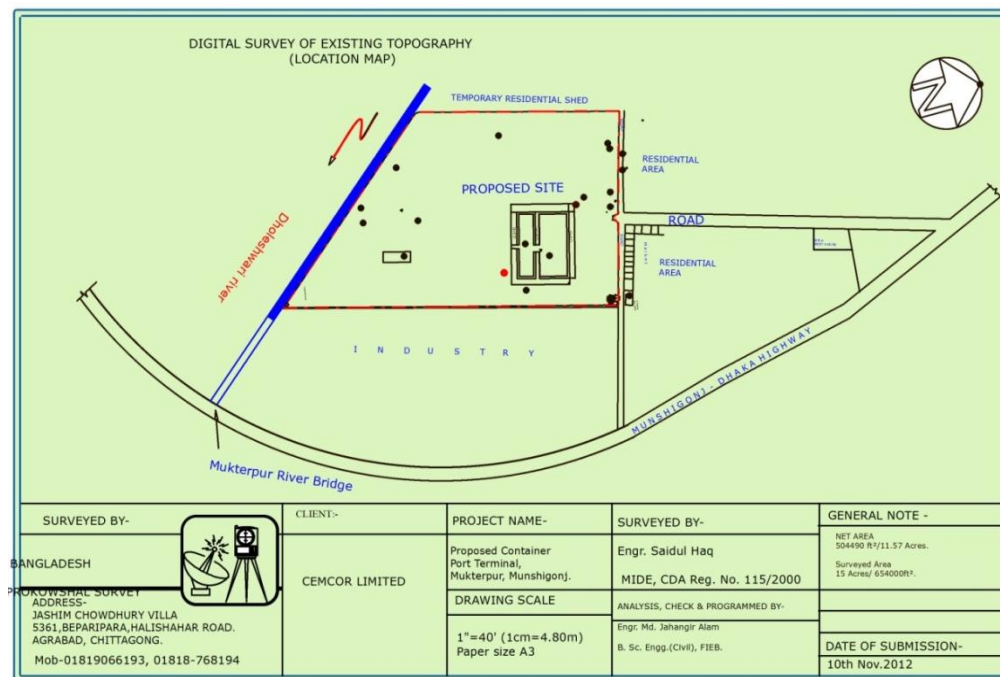


Figure 4.7d: Digital survey of existing Topography (Location Map)

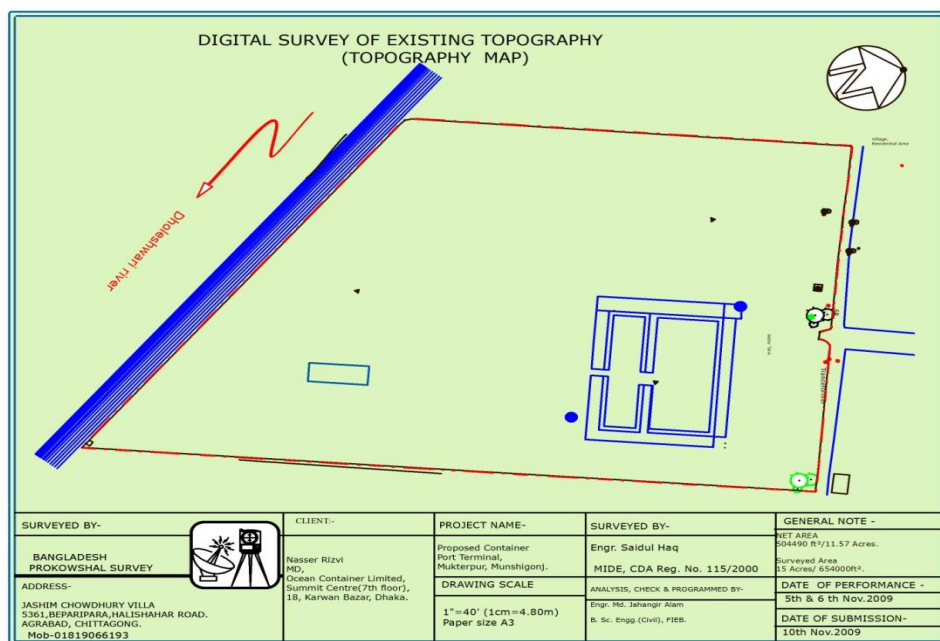


Figure 4.7e: Digital survey of existing Topography (Location Map)

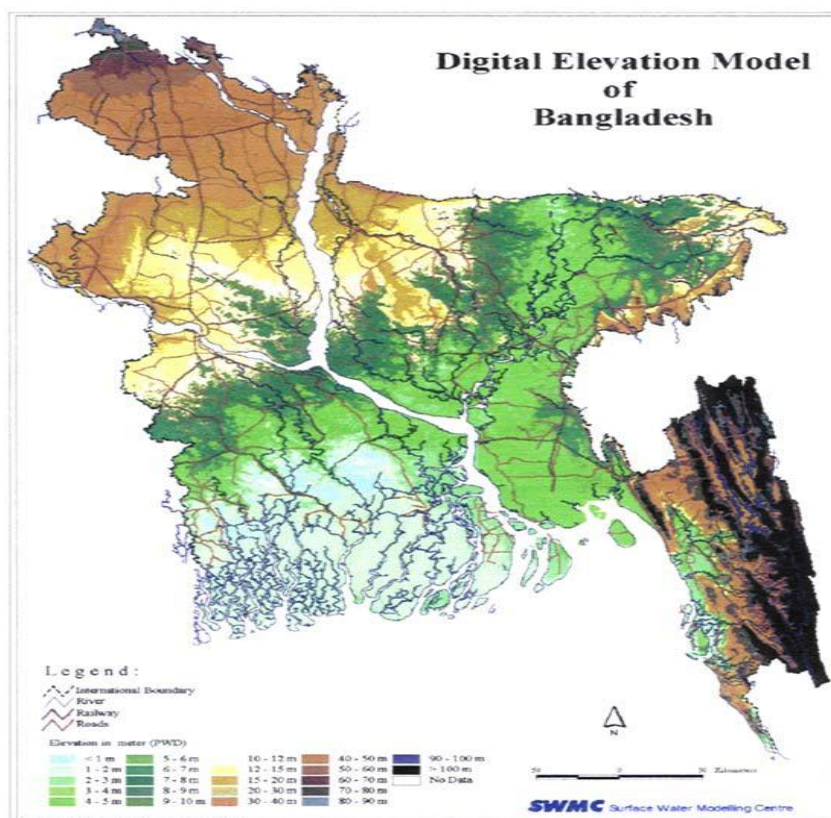


Figure 4.8: Digital elevation model of Bangladesh

4.10 Seismicity

Bangladesh, a densely populated country in South Asia, is located in the north-eastern part of the Indian sub-continent at the head of the Bay of Bengal. Tectonically, Bangladesh lies in the north-eastern Indian plate near the edge of the Indian craton and at the junction of three tectonic plates – the Indian plate, the Eurasian plate and the Burmese micro plate. These form two boundaries where plates converge– the India-Eurasia plate boundary to the north forming the Himalaya Arc and the India-Burma plate boundary to the east forming the Burma Arc (Fig. 4.9).

Active faults of regional scale capable of generating moderate to great earthquakes are present in and around Bangladesh. These include the Dauki fault, about 300 km long trending east-west and located along the southern edge of Shillong Plateau (Meghalaya-Bangladesh border), the 150 km long Madhupur fault trending north-south situated between Madhupur Tract and Jamuna flood plain, Assam-Sylhet fault, about 300 km long trending north east southwest located in the southern Surma basin and the Chittagong-Myanmar plate boundary fault, about 800 km long runs parallel to Chittagong-Myanmar coast (Fig. 4.9).

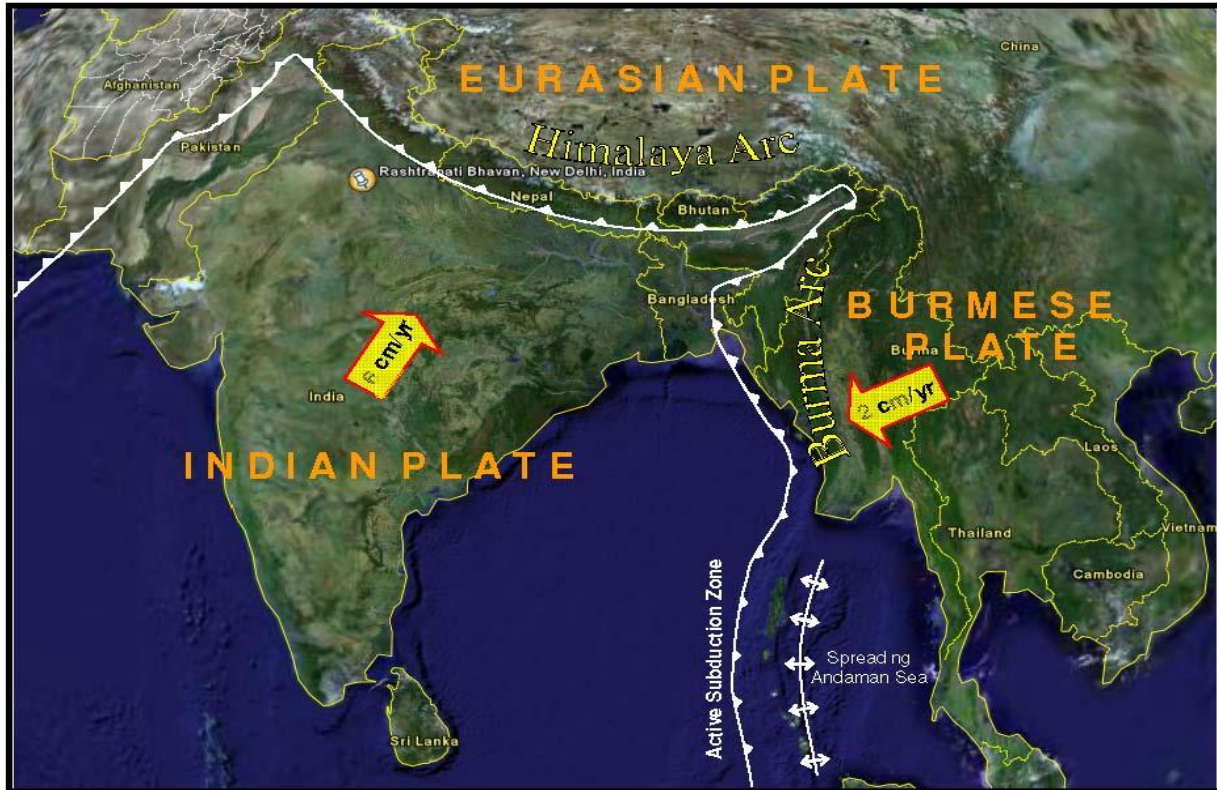


Fig. 4.9: Regional tectonic setup of Bangladesh with respect to plate configuration

Dhaka is situated in the central part of the country on the bank of the Buriganga River and at the southern tip of the Madhupur Tract dating back to the Pleistocene age. The Madhupur Tract is an area of recent uplift within the delta and the surface of the tract is in general higher on the west, sloping very gently eastward to disappear beneath younger sediments (Fergusson, 1863; Morgan and McIntire, 1956). Dhaka is surrounded by the old Brahmaputra floodplain in the north and east, by the Ganges-Meghna flood plain in the south and by the Jamuna flood plain in the west. Dhaka is slightly elevated above the surrounding floodplains and represents mostly flat land with minor undulations. Topographically Dhaka is of low relief with many low depressions. According to Alam (1988), the Madhupur Tract is structurally controlled. The Pleistocene sediments of Madhupur Tract have been affected by numerous episodes of faulting. These faults are probably the branch out surface faults from the low dipping western extension of Burma Arc detachment fault. Dhaka lies within 50 to 500 km distances from the seismogenic faults and sits on the Burma Arc detachment fault.

Fig. 4.10 is the Digital Elevation Model (DEM) which showing geological faults of Bangladesh and surroundings potential sources of major earthquakes.

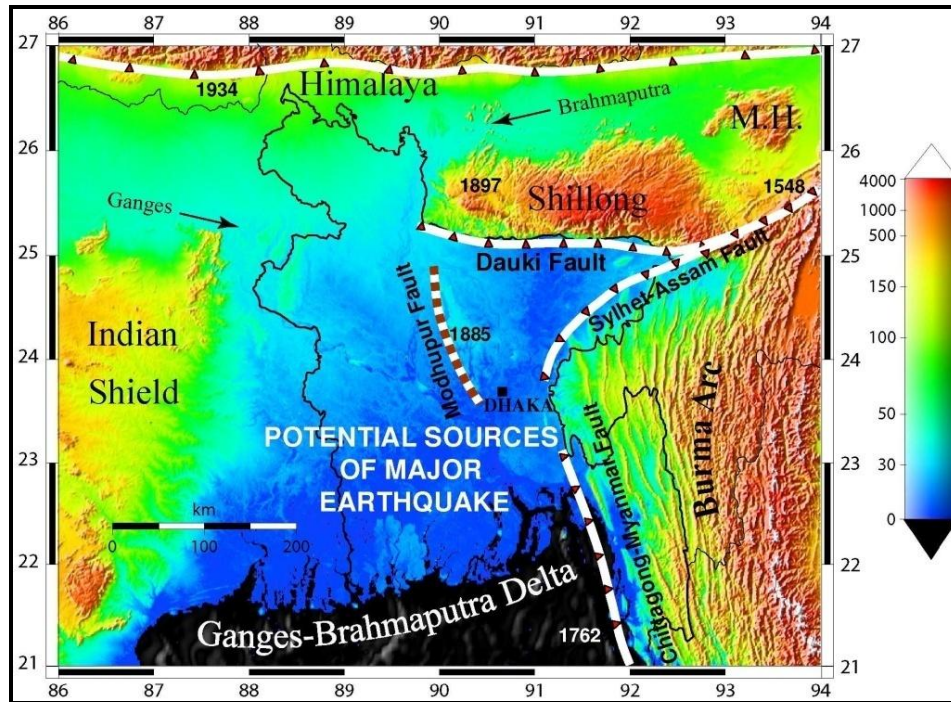


Fig. 4.10: Digital Elevation Model (DEM) of Bangladesh and surroundings showing geological faults – potential sources of major earthquakes in Bangladesh.

On the basis of distribution of earthquake epicentres and morpho tectonic behaviour of different tectonic blocks Bangladesh has been divided into three generalized seismic zones (fig 4.11). Zone-II comprising the central part of Bangladesh represents the regions of recent uplifted Pleistocene blocks of the Barind and Madhupur Tracts, and the western extension of the folded belt. The zone II consists of the regions of recent uplifted Pleistocene blocks of the Barind and Madhupur and the western extension of the folded belt and the Bask coefficient for this zone is 0.05. Nawabganj area within the vicinity of Dhaka falls in seismic zone II of the seismic zoning map of Bangladesh shown in Fig 4.11.

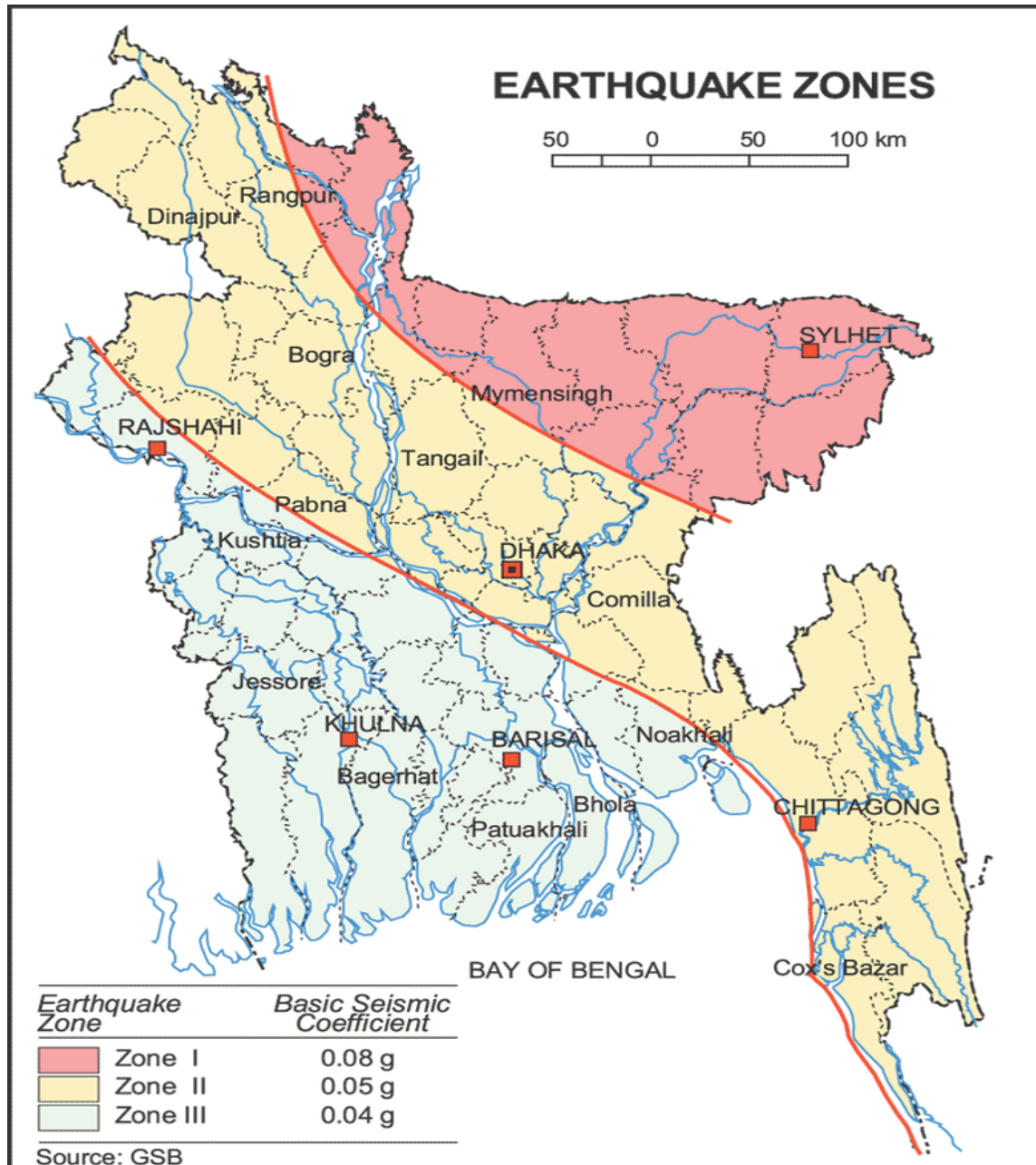


Fig 4.11: Earthquake Zoning Map of Bangladesh

Dhaka suffered ground shaking of the order III to VIII on the Modified Mercalli (MM) scale from both teleseismic (distant) and local earthquakes during historic and recent times. Among all the earthquakes that Dhaka has suffered from, the earthquakes of 1762, 1812, 1865, 1885 and 1897 were the most severe earthquakes in recent recorded history.

4.11 Biological Environment

An ecological survey was carried out as a part of the ESIA in order to assess the floral and faunal diversity in areas surrounding the proposed project site on the bank of the Dhaleshwary River. The main purposes of the ecological survey were:

- to enlist the port and wildlife species with their national and international status,
- to enlist critically endangered, rare and threatened flora and fauna species,
- to investigate the distribution and abundance of flora and fauna including fish species, and
- to make an assessment of the impacts for the proposed project activities on the ecological environment.

Floral and faunal diversity fluctuate seasonally due to environmental reasons. Seasonal survey (spanning over a year) could provide detailed information on ecological diversity for the study area. However, in the present study, a survey was conducted in August-September 2014 during daytime. The ecologist of the EIA team visited the areas surrounding the project site (approximately 5 km surrounding the project site) to collect first hand information on floral and faunal diversity. Literature review and informal interviews with local people were also conducted as a part of the study. Faunal and mammalian survey was done through visual search and also through discussion with local people. Aural and visual search were the main survey method for ornithological survey. Fish and fishery information were collected through field study, fishermen interview as well as local fish market survey. Floral survey was conducted through visual and rapid field surveys.

Floral and Faunal Diversity

Flora

The proposed project is in a rural setting with greenery. This includes homesteads,

horticulture, roadside forest, natural vegetation, and agricultural crops. Besides highland (elevated) afforestation and homesteads, the remaining area is mostly lowland and generally interconnected with certain manmade barriers and kacha roads here and there.

Due to roadside forest and certain homestead forests, the area is rich with floral diversities. Different fruit, fuel wood trees along with various shrubs are abundant. Among the trees, the most widely available ones are Shilkoroi, fulkoroi, Mehagani, Shimul, etc. Also there are some fruit trees such as Mango, Coconut, Jackfruit, Battle nut, guava etc.

Aquatic flora is divided into three major types - tree, shrub and herb. Aquatic floral species grow in rivers, canals, ditches, seasonal wetland and low lying agricultural lands in submerged, free-floating, or rooted floating states. Common aquatic floral species in the study areas include Water hyacinth - *Eichhorniacrassipes*, Khudipana - *Lemnaperpusilla*, and Kalmi - *Ipomoea aquatic*. Table 4.18 shows the complete list of identified aquatic floral species and a pictorial view of wetland (falling under 14 botanical families) in the study area.

Table 4.18: Identified aquatic flora in the study area

Name			Habit
Scientific	Family	Native	
<i>Alternanthera philoxeroides</i>	Amaranthaceae	Helencha	Herb
<i>Colocasia esculenta</i>	Araceae	Katchu	Herb
<i>Aponogeton natans</i>	Aponogetonaceae	Ghenchu	Herb
<i>Ipomoea aquatica</i>	Convolvulaceae	Kalmi	Herb
<i>Ipomoea fistulosa</i>	Convolvulaceae	Dholkalmi	Herb
<i>Enhydra fluctuans</i>	Compositae	Helencha	Herb
<i>Ceratophyllum dumersum</i>	Ceratophytaceae	Jhanjhi	Herb
<i>Hygroryza aristata</i>	Gramineae	Phutki janglidhan	Herb
<i>Hydrilla verticillata</i>	Hydrocharitaceae	Janjhi, Kurcli	Herb
<i>Vallisneria spiralis</i>	Hydrocharitaceae	Patajhangi	Herb

<i>Lemna perpusilla</i>	Limnaceae	Khudipana	Herb
<i>Nymphaea sp</i>	Nymphaeaceae	Shapla	Herb
<i>Eichhornia crassipes</i>	Pontederiaceae	Kachuripana	Herb
<i>Monochoria vaginalis</i>	Pontederiaceae	Sarkachu	Herb
<i>Fagopyrum hydropiper</i>	Polygonaceae	Biskhatali	Herb
<i>Salvinia cuculata</i>	Salviniaceae	Indurkanipana	Herb
<i>Utricularia aurea</i>	Utriculariaceae	Jhangi	Herb



Photo 4.2 : Water Hyacinth (Aquatic Flora) in the Daleswari River

Terrestrial flora:

Some terrestrial flora has been observed in areas surrounding the proposed project site; however, there are very few flora present within the project site. Some of these grow naturally, while most have been ported. Generally, terrestrial flora makes a complex ecosystem, with which wildlife develop direct relationship through their ecological niche. Common terrestrial flora in the study area include Betelnut - *Areca catechu*, Coconut - *Cocos nucifera*, Mango - *Mangifera indica*, Rain tree - *Samanea saman* etc. Three types of terrestrial floral habit - tree, shrub and herb exists in the project areas. Most floral species particularly the trees and shrubs are cultivated and ported and these have commercial values. A total of 41 floral species have been identified, which include 18 tree, 17 herb, and 6 shrub species. Percentage of identified terrestrial floral habit is shown in

Fig. 4.12, which is indicative of the richness of terrestrial floral diversity. The complete list of identified terrestrial floral species (belonging to 13 botanical families) is shown in Table 4.19.

Table 4.19: Identified terrestrial flora in the study area

	Name		Habit
Scientific	Family	Native	
<i>Mangifera indica</i>	Anacardiaceae	Am	Tree
<i>Alternanthera sesilis</i>	Amaranthaceae	Haicha	Herb
<i>Mikania cordata</i>	Compositae	Assamlata	Herb
<i>Blumea lacera</i>	Compositae	Sheyalmutra	Herb
<i>Carica papaya</i>	Caricaceae	Pape	Shrub
<i>Ipomoea fistulosa</i>	Convolvulaceae	Dholkalmi	Herb
<i>Coccinia indica</i>	Cucurbitaceae	Telakucha	Herb
<i>Ricinus communis</i>	Euphorbiaceae	Reri, venna	Shrub
<i>Phyllanthus reticulatus</i>	Euphorbiaceae	Chitki	Shrub
<i>Centolla asiatica</i>	Hydrocotyleaceae	Than kuni	Herb
<i>Cocos nucifera</i>	Palmae	Narikel	Tree
<i>Areca catechu</i>	Plamae	Supari	Tree
<i>Borassus flabellifer</i>	Palmae	Tal	Tree
<i>Phoenix sylvestris</i>	Palmae	Khejur	Tree
<i>Artocarpus heterophyllus</i>	Moraceae	Kathal	Tree
<i>Ficus glomifera</i>	Moraceae	Jagadumur	Shrub
<i>Ficus hispida</i>	Moraceae	Kakdumur	Shrub
<i>Chrysopogon aciculate</i>	Gramineae	Chore Kanta	Herb
<i>Axonopus compressus</i>	Gramineae	Turfgrass	Herb
<i>Molocanna bambusoides</i>	Gramineae	Muli bansh	Shrub
<i>Cynodon dactylon</i>	Gramineae	Durbaghas	Herb
<i>Saccharum spontaneum</i>	Graminaceae	Kash	Herb
<i>Albizia procera</i>	Leguminosae	Koroi	Tree
<i>Acacia auriculiformis</i>	Leguminosae	Akashmoni	Tree
<i>Dalbergia sissoo</i>	Leguminosae	Sisu	Tree
<i>Samanea saman</i>	Leguminosae	Rendi	Tree
<i>Delonix regia</i>	Leguminosae	Krishnachura	Tree
<i>Erythrina variegata</i>	Leguminosae	Mandar	Tree

Acacia mangium	Leguminosae	Mangium	Tree
Azadirachta indica	Meliaceae	Neem	Tree
Swietenia mahagoni	Meliaceae	Mehagini	Tree
Musa spp	Musaceae	Kala	Herb
Mimosa invisa	Mimosoidae	Lazzaboti	Herb
Polygonum hydropiper	Polygonaceae	Bishkatali	Herb
Anthocephalus chinensis	Rubiaceae	Kadam	Tree
Zizyphus mauritiana	Rhamnaceae	Boroi, Kul	Tree
Lindernia procumbens	Scrophulariaceae	Bakpuspa	Herb
Datura metol	Solanaceae	Dhutra	Herb
Clerodendrum viscosum	Verbinaceae	Vat	Herb
Tectona grandis	Verbenaeae	Teak	Tree



Photo 4. 3: Terrestrial Flora (Tree)



Photo 4.4 : Terrestrial Flora(Herb) in project site



Photo 4.5 : Terrestrial Flora (Shrub) in the project site

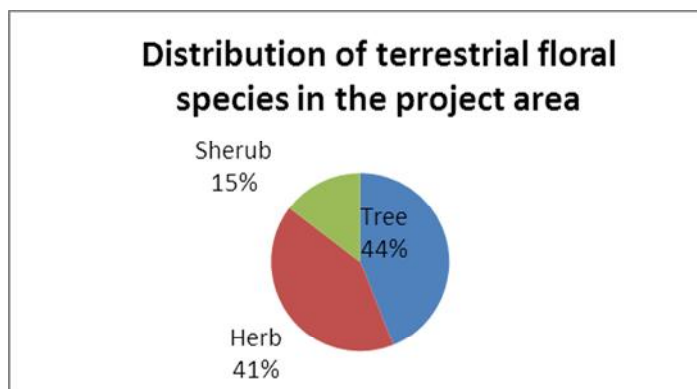


Figure 4.12 : Distribution of terrestrial floral species in the project site

Terrestrial Faunal species in the project site

Aquatic Fauna (Fishes)

Fish is still reasonably available in the area, given the overall and increasing scarcity of fish in the country. Small fishes, which are very popular also in overall Bangladesh, are available and caught and used widely, particularly during early monsoon and pre-winter season. Among reptiles, narrow headed soft-shell turtle deserves special mention. Among birds, Bok, Salik, Finge etc. deserve special mention. The fishes include catfishes (Magur and Shing), major carps (Katla, Rui and Mrigal), minor carps (Puti), other (Tengra, Boal, Mola, Taki, Shol). Also prawn, particularly the popular small prawns, locally known as Ichha, Wildlife, and Reptile. The common types of reptiles are found in the area, water snake, house lizard, soft-shell, turtle etc. The following pictorial view shows the aquatic faun close to the project site.



Photo 4.6: Aquatic fauna (fish species) in the project site & **Photo 4.7**

Table 4.20: Identified aquatic fauna (+ fish) in the study area

Class	Family	English Name	Scientific Name
Amphibia	Ranidae	Skipper Frog	<i>Euphlyctis cyanophlyctis</i>
Reptilia	Bataguridae	Indian Roofed Turtle	<i>Kachuga tecta</i>
	Homalopsidae	Com. Smooth Water Snake	<i>Enhydris enhydris</i>
	Natricidae	Checkered Keelback	<i>Xenochrophis piscator</i>
Aves	Dendrocygnidae	River Tern	<i>Sterna albifrons</i>
		White-breasted Waterhen	<i>Amaurornis phoenicurus</i>
	Jacaniidae	Bronze Winged Jacana	<i>Metopidius indicus</i>
	Phalacrocoracidae	Little Cormorant	<i>Phalacrocorax niger</i>
Mammalia	Platanistidae	Ganges River Dolphin	<i>Platanista gangetica</i>
	Anabantidae	Climbing Perch	<i>Anabas testudineus</i>
	Ariidae	Gagora Catfish	<i>Arius gagora</i>
	Belontiidae	Sunset Gourami	<i>Colisa sota</i>
	Bagridae	Tengra Mystus	<i>Mystus tengara</i>
		Long-whiskered Catfish Mrigal	<i>Aorichthys aor</i> <i>Cirrhinus mrigala</i>

Osteichthyes	Cyprinidae	Rohu	<i>Labeo rohita</i>
		Catla	<i>Catla catla</i>
		Swamp/ Chola Barb	<i>Puntius chola</i>
		Indian Carplet	<i>Amblypharyngodon microlepis</i>
	Channidae	Asiatic Snakehead	<i>Channa orientalis</i>
		Spotted Snakehead	<i>Channa punctatus</i>
		Giant Snakehead	<i>Channa marulius</i>
	Claridae	Magur	<i>Clarius batrachus</i>
	Chacidae	Indian Chaca	<i>Chaca chaca</i>
	Gobiidae	Bumblebee Goby	<i>Brachygobius nunas</i>
		Tank Goby	<i>Glossogobius giuris</i>
	Heteropneustidae	Stinging Catfish	<i>Heteropneustes fossilis</i>
	Notopteridae	Grey Featherback	<i>Notopterus notopterus</i>
	Nandidae	Mottled Nandus	<i>Nandus nandus</i>
	Mastacembelidae	One-stripe Spinyeel	<i>Macrognathus aculeatus</i>
	Synbranchidae	Gangetic Mudeel	<i>Monopterusuchia</i>
	Polynemidae	Indian Threadfish	<i>Polydactylus indicus</i>

Terrestrial fauna

Wild animals that depend on terrestrial habitat is known as terrestrial fauna. Several species of amphibia, reptile, bird and mammal are the main components of terrestrial fauna. Areas surrounding the project site have different types of land, including agricultural dry land / seasonal wetland, homestead land, fallow land, ditches, which provide typical environment for terrestrial fauna. Terrestrial wildlife is divided into four major group viz. mammal, bird, reptile and amphibia. A total of 56 faunal species have been identified in the study area, which include four amphibia, nine reptile, 33 aves and 10 mammals. Percentage of identified terrestrial faunal habit is shown in Table 4.20 and the complete terrestrial faunal list (belonging to 38 zoological families) is given in Table 4.23. The pictorial view shows the terrestrial fauna in the project site.

Threatened Flora and Fauna

Floral and faunal species that exist as threatened (endangered, critically endangered, etc) condition are known as threatened species. There are specific criteria to declare a species as threatened. A total of 54 freshwater fish and 147 inland wildlife species are threatened species in Bangladesh (IUCN, 2000a; 2000b; 2000c; 2000d; 2002). No threatened floral species has been identified in the study areas.

Table 4.21: Identified terrestrial fauna in the study area

Class	Family	English Name	Scientific Name
Amphibia	Bufonidae	Common Toad	<i>Bufo melanostictus</i>
	Ranidae	Bull frog	<i>Hoplobatrachus tigerinus</i>
		Cricket frog	<i>Limnonectes limnocharis</i>
	Rhacophoridae	Maculated Tree frog	<i>Polypedates maculatus</i>
Reptilia	Agamidae	Common Garden Lizard	<i>Calotes versicolor</i>
	Colubridae	Rat Snake	<i>Coluber mucosus</i>
	Dipsadidae	Common Wolf Snake	<i>Lycodon aulicus</i>
	Elaphidae	Common Krait	<i>Bungarus caeruleus</i>
	Gekkonidae	Common House Lizard	<i>Hemidactylus flaviviridis</i>
		Common House Lizard	<i>Hemidactylus brooki</i>
	Scincidae	Common Skink	<i>Mabuya carinata</i>
	Varanidae	Yellow Monitor Lizard	<i>Varanus salvator</i>
		Grey Monitor Lizard	<i>Varanus bengalensis</i>
	Accipitridae	Brahminy Kite	<i>Haliastur indus</i>
	Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>
		White-throated Kingfisher	<i>Halcyon smyrnensis</i>
	Apodidae	Asian Palm Swift	<i>Cypsiurus balasienis</i>
	Ardeidae	Indian Pond heron	<i>Ardeola grayii</i>
		Cattle Egret	<i>Bubulcus ibis</i>
		Little Egret	<i>Egretta garzetta</i>
	Centropodidae	Indian Cuckoo	<i>Cuculus micropterus</i>
Aves	Columbidae	Spotted Dove	<i>Streptopelia chinensis</i>
		Rock Pigeon	<i>Columba livia</i>
	Corvidae	House crow	<i>Corvus splendens</i>
		Rufous Tree Pie	<i>Dendrocitta vagabunda</i>
	Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>

	Jacaniidae	Bronze-winged Jacana	<i>Metopidius indicus</i>
	Megalaimidae	Lineated Barbet	<i>Megalaima lineata</i>
	Motacillidae	White-browed Wagtail	<i>Motacilla alba</i>
	Muscicapidae	Oriental Magpie Robin	<i>Copsychus saularis</i>
		White-throated Fantail	<i>Rhipidura albicollis</i>
	Nectariniidae	Purple Sunbird	<i>Nectarinia asiatica</i>
		Little Spiderhunter	<i>Arachnothera longoropstra</i>
	Oriolidae	Black-headed Oriole	<i>Oriolus xanthornus</i>
	Psittacidae	Roseringed Parakeet	<i>Psittacula krameri</i>
	Picidae	Black-rumped Flamback	<i>Dinopium benghalense</i>
	Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>
	Passeridae	House Sparrow	<i>Passer domesticus</i>
		Baya Weaver	<i>Ploceus philippinus</i>
		Paddy field Pipit	<i>Anthus rufulus</i>
	Strigidae	Brown Fish Owl	<i>Ketupa zeylonensis</i>
	Scolopacidae	Common Sandpiper	<i>Actitis hypoleucos</i>
	Sulviidae	Striated Grassbird	<i>Megaurus palustris</i>
		Common Tailorbird	<i>Orthotomus sutorius</i>
	Sturnidae	Asian Pied Starling	<i>Sturnus contra</i>
		Common Myna	<i>Acridotheres tristis</i>
	Felidae	Fishing cat	<i>Prionailurus bengalensis</i>
	Herpestidae	Small Indian Mongoose	<i>Hervested auropunctatus</i>
Mammalia	Muridae	Bandicoot Rat	<i>Bandicota indica</i>
		Common House Rat	<i>Rattus rattus</i>
		House Mouse	<i>Mus musculus</i>
		Indian Field Mouse	<i>Mus booduga</i>
		Indian mole Rat	<i>Bendicota bengalensis</i>
	Pteropodidae	Flying Fox	<i>Pteropus gigantius</i>
	Soricidae	Grey Musk Shrew	<i>Suncus murinus</i>
	Vespertilionidae	Indian Pipistrelle	<i>Pipistrellus coromandra</i>

4. 12 Protected Areas, Wildlife Sanctuaries, Game Reserves

Protected area (PA)

Protect Area (PA) refers to an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means i.e., PA is predominantly a natural area established and managed in perpetuity, through legal or customary regimes, primarily to conserve their natural resources (IUCN, 1990). No PA exists at or near any of the study areas.

National Park (NP)

It is a reserved land, usually declared and owned by a national government, protected from most human development and pollution. No NP exists at or near the proposed project sites.

Game reserve (GR)

It is an area of land set aside for maintenance of wildlife for tourism or hunting purposes. No GR exists at or near the study areas.

Ecologically Critical Area (ECA)

It is an environmental protection zone, defined by the Government of Bangladesh under the Bangladesh Environment Conservation Act, 1995, where ecosystem is considered to be threatened to reach a critical state. No ECA exists at or near the study areas.

4.13 Environment and social survey

As part of the Environmental & Social Impact Assessment (ESIA) of the proposed River Terminal project, a social and environmental baseline study was carried out in areas surrounding the project site i.e. West Mukterpur village. This has been done on the basis of several surveys around the locality as well as Munshigonj Upazila Profile. Bangladesh Bureau of Statistics (BBS), Banglapedia, concerned books and periodicals were also consulted. Household Questionnaire survey, FGDs and KIIs etc.

4.13.1 Administrative Areas

Area and location: The upazila occupies an area of 131.00 sq. km. It is located between 23° 29' and 23° 37' north latitudes and between 90° 34' and 90° 43' east longitudes. The

upazila is bounded on the north by Bandar of upazila of narayanganj zila, on east by Daudkandi upazila of comilla zila, on the south by Matlab upazila of chandpur zila and on the west by Tongibari upazila.

Munshiganj zila, formerly a subdivision under Dhaka zila, was established in 1984. The zila consists of 6 upazilas, 67 unions, 564 mauzas, 919 villages, 2 paurashavas, 18 wards and 73 mahallas. The upazilas are Gazaria, Tongibari, Serajdikhan, Lohajang, Sreenagar and Munshiganj Sadar. The main rivers are Dhaleshwari, Ichamati and Kaliganga. The Upazila consists of 14 union parishads, 178 mouzas and 305 villages.

4.13.2 Land Use

Total cultivable land is 18208.01 hectares. Among them fallow land is 6272.76 hectares; single crop 47.5%, double crop 37.8% and treble crop land 14.7%.

4.13.3 Demographic Characteristics of the Project Area

4.13.4 Population

Total population as per Munshigonj Upazila Complex within the project area is 269189 of which 49.31% are male and 50.69% are female. The project site is situated in West Mukterpur village and according to the Panchasar union, the population is about 4200 of which about 50% is male and 38% is female with 12% population of 18.

4.13.5 Household

The number of household of Munshigonj Upazila is 47411. Majority of housing in this area are of pacca, semi-pacca, semi-permanent building i.e. walls made of 5 inch brick works and corrugated iron roof. In case of West Mukterpur number of household is about 1050; 38.67% of the households are pacca, 50% semi-pacca and 11.33% kacha. The homestead areas are relatively medium.

4.13.6 Literacy

According to the Banglapedia within the study area have an average literacy rate of

35.4%. The literacy rate among the town people is 53.1% and in West Mukterpur village it is less than 50%.

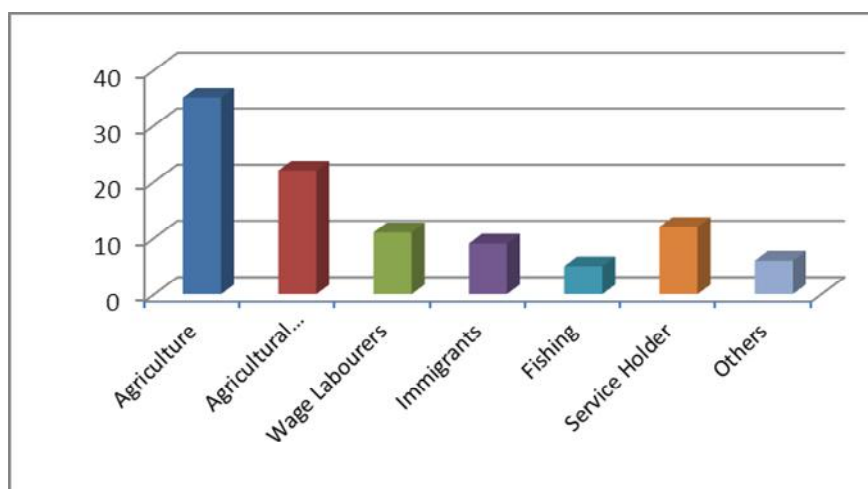
4.14 Utility Services in the Project Area

4.14.1 Sources of Drinking Water

Tube well is the main source of drinking water for the people in the study area. Only district headquarters and some Upazila headquarters are provided with piped water supplied from the Department of Public Health Engineering (DPHE). Safe drinking water is not available to many of the households of the area. These residents depend on wells, pond as their source of drinking water.

4.14.2 Electricity

Electricity in rural Bangladesh is still a relatively scarce commodity, which many households cannot afford even if available at their locality. But in case of West Mukterpur village about 85% of the households in the project area has the electricity facility provided by REB. The following figure 4.13 shows the occupational status of the proposed project site



Source: BCAS field study

Fig 4.13: Distribution of Occupational status of West Mukterpur

4.14.3 Health

District Hospitals and Upazila Health Complexes are located at each district and Upazila of the project area. There are also a large number of private clinics located in each district town, which are within a few kilometers from the project area. But such kinds of health facilities are totally unavailable in West Mukterpur where the site is situated.

4.14.4 Waste Disposal

There are some facilities for garbage or hazardous waste dumping in each municipality area of the district. There is some facility exists for garbage or hazardous waste dumping in the total project area. On the other hand, the local people throw the waste beside the road and nearest river Dalessari.

4.14.5 Emergency Services

There is one firefighting station located at both Munshigonj and Nawabganj Upazila. Since the firefighting station at Narayangonj is closer to West Mukterpur village; this firefighting station response to the firefighting emergency services required in the village. This firefighting station is about 4 km away from Project Site village.

4.14.6 Occupation and Source of Income of Population

As in other parts of the country, the majority of the population in project area is engaged in agriculture. Altogether 22.1% of the population is engaged in Agriculture. Agricultural labourers are of 13.27% of the population. 4.5% of the population is engaged in wage labour, only 1.98 % of the population are engaged in fishing, 4.37% of the population are engaged in weaving, 12.2% of the population is engaged in business. 18.54% of the population is engaged in different services and the others are involved in handloom, transport etc. in the Munshigonj Upazila. In Munshigonj, 45% people are engaged in agriculture & agricultural labourers are of 22%; 11% people are engaged in wage labour and about 10% of service holders are found. About 5% of the population is engaged in

fishing. Many people is working abroad from this area as in our study about 7% people are immigrants or working abroad. Fig 4.14 is presents the occupation in Munshigonj

4.14.7 Ethnic and Religious composition of the Population in the Project Area

The majority of the population in the Munshigonj Upazila is Muslim (>77%) followed by Hindus (20.74%), Christian (2.04%), Buddhist (0.01%) and others 0.01%. In Munshigonj about 85% of the population is Muslim, about 10% of the population is Hindu and rest of the population is Buddhist & Christian.

4.14.8 Archaeological Heritage and Relics

No archeological heritage or such is found in the Panchsar union and the surrounding of the project site.

Chapter-5

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.0 Environmental Impacts

A prepared an Environmental Assessment Checklist was used to screen the proposed Project for determining the tentative environmental impact through this ESIA.

The environmental impacts of the River Terminal Container Depot can be divided into three phases:

- a. Pre-operation phase
- b. Operation Phase
- c. Post-operation phase or decommissioning phase

5.1 Environmental Impacts during Pre-Operation Phase

The major activities during the pre-operation phase of the proposed River Terminal included site preparation and land filling. These activities were already completed during the baseline survey carried out in August 2014. The impacts on environment from various activities during construction phase of the Project have been described in the following sections.

5.2 Environmental Impacts during Construction Phase

The activities carried out during the construction phase were (a) mobilization of equipment, materials and personnel; piling and bank protection works; (b) Construction of embankment and yard facilities; (c) Construction of drainage facilities; (d) Construction of internal roads; (e) Construction of buildings and related civil facilities; and (f) Electro-mechanical works. These activities except for construction of the office building were found completed during the baseline study in August 2014.

Impact on Topography

During construction of the proposed Project, the topography of the Project site will change due to leveling of uneven Jetty site as well as container yard land filling to increase the

height. The filling will involve raising the 14 acres of the project site by 1.5 meters therefore there would be some loss of biodiversity because of filling operation through loss of some vegetation. Therefore the restoration of the lost biodiversity will have to be done by the project sponsors.

In order to restore the loss in biodiversity due to the pre-construction phase and the construction phase it is suggested that plantation of trees, of local species, along the boundary wall of the project be undertaken. This will compensate for the loss in biodiversity.

Impact on Micro-Climate

The Project involves no deforestation and/or removal of significant vegetation. So, the significant increase of local temperature is not anticipated, impact on climate is not anticipated.

5.2.1 Impact on Environmental Resources

Impact on Air quality

During the construction phase of the proposed Jetty and container depot, the important sources of emissions would include those being generated from the operations of construction equipment and machineries, vehicles carrying construction materials to the site and taking construction debris out of the site. If construction equipment, such as stone (aggregate) crushers are used at the site, this may result in significant emission of particulate matter during its operation. Since construction of the proposed River Terminal Container Depot is likely to involve significant earthworks, increase in particulate matters in air from wind-blown dust is also a concern.

Localized and temporary air pollution may be generated from the remaining civil construction works. The air pollution generated from these activities is likely to be localized (affecting immediate surroundings of the emission source/ project site). The number of project-related vehicles is likely to be small compared to the existing traffic in the area. The emission of gaseous CO, NO_x, SO_x from the heavy trucks and earth moving equipment are expected to be within Bangladesh vehicular emission standards.

As mitigation measure, construction materials at the site should be properly covered while hauled and stored. Access roads and internal roads are to be properly cleaned and water sprayed in order to minimize concentration of dust in air. Vehicle movement to and from the site should be properly managed to ensure that it does not significantly aggravate the traffic problem and air pollution.

5.2.2 Ambient Air Quality Standards

National Ambient Air Quality Standards (NAAQS) for Bangladesh is given in Table 5.1

Table 5.1: National Ambient Air Quality Standards (NAAQS) for Bangladesh

Pollutant	Objectives	Averaging period
Carbon Monoxide (CO)	10 mg/m ³	8 hours(a)
	40 mg/m ³	1 hours(a)
Lead (Pb)	0.5 µg/m ³	Annual
Nitrogen Dioxide (NO ₂)	100 µg/m ³	Annual
Particulates of ~10µm (PM ₁₀)	50 µg/m ³	Annual (b)
	150 µg/m ³	24 hours (c)
Particulates of ~2.5µm (PM _{2.5})	15 µg/m ³	Annual
	65 µg/m ³	24 hours
Ozone (O ₃)	235 µg/m ³	1 hours (d)
	157 µg/m ³	8 hours
Sulphur Dioxide (SO ₂)	80 µg/m ³	Annual
	365 µg/m ³	24 hours (a)

5.2.3 Impact on Noise Levels

During the remaining construction phase, medium to low level of noise shall be generated. The major sources of noise pollution are construction activities, movement of vehicles transporting the construction material and equipment to the site. Accordingly, the Bangladesh Standard for noise level is 75 dBA at daytime and 70 dBA at night (ECR, 1997) for industrial projects in mixed zone (commercial cum industrial). The baseline noise measured in August 2014 is shown in Table 4.10

As mitigation measure the major work of construction has been completed at the time of the baseline survey carried out in August 2014. The baseline noises levels are shown in Table 4.10. For the remaining construction work the possibilities of any increase from the baseline values are not expected.

As mitigation step towards maintaining noise levels below DOE standards all construction work will end at 6:00 P.M. and all vehicle movement is to be regulated to avoid traffic congestion in the access road and to ensure that no hooting is allowed. The noise pollution is a significant issue to consider for the construction worker but it will have negligible impact to the surrounding locality as it is not situated in close proximity of the Project site. But for protecting the permanent hearing loss of construction workers, it is to be ensured that they are not exposed for a prolonged period. Because most of these equipment produce high level of noise at close range and exposure to high level of noise for a long period in most cases results into permanent hearing loss. SAPLRT has to follow the OSHA guideline for exposure to specific noise levels for human beings as is provide in the following Table 5.2. Moreover, a rotational work plan is advised for the workers and operators of these equipments.

Table 5.2: OSHA noise exposure limits for the work environment

Noise (dBA)	Permissible Exposure (hours and minutes)
85	16 hrs
90	8 hrs
96	3 hrs 30 min
102	1 hr 30 min
108	40 min
115	15 min
121	6 min
127	3 min
130	1 min

Source: Marsh, 1991, p. 322

Note: Exposure above or below the 90 dBA limit has been 'time weighted' to give what OSHA believes are equivalent risks to a 90 dBA eight-hour exposure.

Table 5.3 shows the typical noise levels generated by some of the construction equipment expected to be used during the construction phase. As seen from the table, the local peak noise level for non-continuous construction activity may reach to as high as 90 dB(A), depending on the type of equipment.

Table 5.3: Noise Levels Generated By Construction Equipment (measured at 1 m distance)

Equipment	Noise Level (dB(A))
<i>Earth Movers</i>	
Front Loaders	72-84
Backhoes	72-93
Tractors	76-96
Scrapers, Graders	80-93
Pavers	86-88
Bull dozer	86-88
Excavator	84-86
Trucks	82-94
<i>Material Handlers</i>	
Concrete Mixers	75-88
Concrete Pumps	81-83
Cranes	75-86
Winch	85-88
<i>Stationary</i>	
Generators (in canopy)	71-82
Electric Saw	81-85
Wood Planer	81-85

5.2.4 Impact of HFO

HFO required to run the generator will be procured from Bangladesh Petroleum Corporation (BPC) by Tanker Lorries. The takers will unload the HFO into the storage tanks of the project. There may be spillages during the unloading operation. Adequate preventive measures will be needed to ensure that no spillage of HFO will take place into the surrounding environment.

5.2.5 Impact on Surface Water Quality

The construction and operation of the proposed Project will have major impact on the surface and ground water quality in the Project area. Contamination to water bodies may result due to oil spilling during construction activities and/or surface runoff from the construction site to the nearby water body. Turbidity levels of the immediate water body may increase, if the surface runoff from the river terminal container depot cannot be controlled. As mitigation measure there should be a containment tank installed of 1.5 times the HFO storage capacity in order to prevent accidental leakage of HFO.

Spent lubricating oil will be generated during the construction period from the heavy construction equipment like the tractors, piling equipment and cranes. The spent oil should be collected and put into drums and sold to outside contractors.

5.2.6 Impact on Ground Water Quality

Ground water pollution can take place, if chemical substances and oily waste get leached by precipitation of water and percolate to the ground water table. Reducing spilling at the construction site will minimize the chances of leaching chemicals to the ground water. There will be minimal use of chemicals in the construction phase of the project. However, there will be generation of spent lubricant which if allowed to leach into the ground water can have significant to the ground water contamination in the long run. Adequate management of the spent lubricant collection and disposal through contractors who are authorized to recycle or dump in Government approved landfills.

5.2.7 Impact on Ecological Resources

Impact on Terrestrial Ecology

There is no designated wildlife sanctuary, wetland or reserve forest in the close vicinity of the proposed container depot. The Project activities do not associate with any type of disturbance to terrestrial ecology.

Impact on Wild Life

The faunal species in the project area is mainly of those associated with manmade habitat. As there is no wild life that faces extinction (Reference IUCN Red List) in the project area, no adverse impact on wild life is expected. As the project will not have any high tension transmission line the possibilities of electrification of birds will be none.

Impact on Aquatic Ecology

Aquatic ecology can be affected due to surface runoff. During the construction phase there will be little potentials of chemical use and therefore the runoff from the project area in the river Dalweswari. There are chances of surface runoff during construction activity to adjacent water body Dhaleshwary River. The only possible is spent lubricating oil from the construction equipment. This has been discussed. The surface runoff should be routed to the sedimentation pond to avoid the river water pollution.

5.2.8 Occupational Health and Safety Impacts

Implementation of Occupational Health and Safety Programme as outlined in the IFC EHS guidelines needs to be complied with to address all aspects of workers health and safety in relation to the construction period of the project. Job specific medicals checkup for all employees is mandatory. The employees newly recruited must be given EHS training prior to resumption of work.

SAPLRT authority will need to prepare an Occupational Health and Safety Manual which must cover the following issues:

- Policy and Objectives;
- Appointment of qualified EHS specialist(s)

- Detailed section wise OHS guidelines
- Details of how rules and updates (if required) will be communicated to workers
- Identification and risk assessment of hazardous activities and high risk areas;
- Emergency Response Plan;
- Training on Emergency Response Plan;
- Safe working methods for hazardous activities;
- Ensure all personnel are provided with all required Personal Protective Equipment (PPE) for the environment they are in and the tasks they are performing;
- Implementation of a Grievance Redress Mechanism;
- Implementation of a Lock-out Tag-out program; and
- Reporting and investigation procedure for all severe and minor accidents, and near misses.

Ensuring all subcontractors (if any) sign and agree to the site EHS Plan. Provide training for all subcontractors to ensure site procedures are fully understood and complied with.

5.2.9 Traffic, Transport, Road and River Safety

Road traffic flows to and from the Project site is going to increase during the remaining part of the construction phase due to increased movement of vehicles carrying construction materials, equipment and machinery, and personnel. During the construction remaining construction phase, traffic disturbance needs to be minimized by avoiding high-density areas, proper traffic signs, ensuring using designated access roads and avoiding road blockage through traffic volume management.

In addition, there is a potential risk of the access road being adversely affected during carrying of construction equipment. The 25feet width of highway from Dhaka to Muktarpur is designed to bear 10-12 Ton. This is adequate for the transportation of the construction equipment. However, the access road from the highway to the project site will need upgrading. In order to minimize the risk due to increase traffic of heavy Lorries and trucks it is recommended that the movements should be done in the night time but with care.

5.2.10 Waste Generation and Disposal

Construction Debris, Waste and House-keeping Arrangement

Project construction activities will result in generation of considerable amount of inert solid wastes, including lumber, excess concrete, metal and glass scrap, and empty containers used for non-hazardous substances. Management of these wastes will be the responsibility of the Contractors as recommended in the EMP section of this report. Typical management practice includes proper temporary storage of waste and debris, and good housekeeping of work areas. No part of this construction waste should be mixed with the domestic solid waste. Separation of saleable solid waste through screening process and dispose to the secondary users can be mitigation measures. Rest of the insignificant waste shall be disposed in a safe manner.

5.2.11 Accommodation Facility

There were no accommodation facilities in the project area during the construction phase as all the workers belonged to that area.

5.2.12 Sewerage Management:

As mentioned in the previous section there were no workers shed existing in the project site during the baseline study in August 2014. According to the project sponsors all the workers are from the local area and no accommodation facilities were provided. Therefore, the requirement of an elaborate sewerage disposal system was not required. However, adequate numbers sanitary latrines and soak pits were installed for the workers during the construction phase. For this purpose, a wastewater generation rate of 50 litres per capita per day has been assumed for 50 to 100 workers.

Wastewater generated from different construction activities is not likely to be significant in volume. Disposal of such waste water may be carried out by draining them in the municipal drainage system.

5.3 Environmental Impacts during Operation Phase

Typical environmental issues related to operation phase of the proposed project operations include (IFC, 2007):

- (i) Wastewater and waste management;
- (ii) Hazardous material and oil management;
- (iii) Air emissions;
- (iv) Noise; and
- (v) Biodiversity.

For the proposed SAPL RT project, other important issues include impact of the project on transport and communication (especially on road traffic), employment and economy in general.

Typical effluents associated with port activities may include storm-water and sewage from port operations, sewage, ballast water (e.g., from oil tankers), bilge water, and vessel-cleaning wastewater from ships (IFC, 2007). Hazardous material at port typically includes hazardous cargo, oil, fuel and hazardous materials used in different maintenance activities. Spills may occur due to accidents, equipment failure, improper cargo transfer or fueling.

The most significant sources of air pollutants from port operations typically include combustion emissions from ships' propulsion and auxiliary engines and boilers, followed by combustion source emissions from vehicles and land-based engines and boilers (IFC, 2007). Volatile organic compounds (VOC) may also be emitted from fuel storage and transfer.

Typical noise sources in ports include cargo handling, vehicular traffic, and loading/unloading of containers and ships. Activities that could affect biodiversity include maintenance dredging and disposal of dredge spoils, and discharge of ballast water and sediment from ships. While assessing the possible project impacts during its operational phase, the nature of operation of the proposed SAPL RT should be kept in mind. The important issues include the following:

- The proposed river terminal will be used for transportation of cargo/ container to and from Chittagong; it will not handle any passenger vessel. Import cargo from Chittagong will be unloaded at the river terminal, and will be delivered to destinations in the greater Dhaka, primarily through the Ponchoboti-Muktarpur road.
- No fueling/ refueling activities will be carried out at the proposed river terminal; these will be handled at Chittagong. The proposed river terminal will not have any fuel storage facility.

The major environmental issues/ impacts resulting from the operation of the proposed river terminal are discussed below.

5.3.1 Wastewater and Waste

Because of small-scale operation (initially 2 vessels, and 8 vessels at the peak of its operation) and absence of passenger vessels, the volume of sewage, ballast water, bilge water, and vessel-cleaning wastewater from the barges to be used for shipment of cargo/ container at the SAPL RT would be small. Besides, there will be separate system for disposal of storm-water and sewage from the river terminal operations. However, improper disposal of ship waste/ wastewater may lead to pollution. Hence proper management of ship and terminal waste/ wastewater is of utmost importance for prevention of environmental pollution, particularly water pollution.

As discussed in previous chapter the Dhaleshwary river water in the immediate vicinity of the project site contains elevated concentration of a number of contaminants that most likely come both from domestic (e.g., TC, FC, NH₃) and industrial sources (NH₃, BOD, COD, Sulfate, Lead). For example, effluent discharged from a textile mill, located adjacent to the proposed project site, contains high concentrations of Ammonia (43.8 mg/l), BOD₅ (112 mg/l) and COD (355 mg/l). Thus, effluents from industrial and domestic sources surrounding the project site are major sources of pollution of the river water close to the project site. Enforcement of existing environmental regulations and regular monitoring by concerned authorities are required for identification of sources and management of such pollution in and around the project area.

5.3.2 Hazardous Material and Oil Management

The proposed SAPL RT has been designed keeping in mind the fast-growing RGM sector which has high volumes of both import and export. The river terminal is not likely to handle any hazardous material. Besides, fueling operations will not be carried out at the terminal (it will be handled at Chittagong), and there will be no fuel storage facility at the proposed river terminal for fueling of the container vessels. This will significantly reduce the risk of oil spills and related hazards.

The regular fuel handling will be the diesel used in the power generation. The diesel storage tank capacity is estimated to be 2000 liter. There are potentials of leakage from this diesel storage tank therefore there is a need to install a containment tank having a capacity of 1.5 times the maximum storage capacity of 2000 liters.

There is requirement of management of different types of oil and fuel used in different maintenance activities. The spent lubricating oils should be stored in drums and disposed through outside authorized contractors for either recycling or dumping in approved landfills.

5.3.3 Impact on Road Infrastructure and Traffic

Majority of the garments industries in Bangladesh is located at Gazipur, Savar, and Narayanganj. The existing road from Ponchoboti to Muktarpur bridge will be used for

transportation of cargo and containers to and from the proposed SAPL RT. As noted earlier, the physical condition of the 10 km road from Ponchoboti to Muktharpur Bridge is poor; the road is narrow and the road pavement is damaged along many stretches of the road.

Traffic survey revealed that the road is very busy, particularly at Ponchoboti; over 1000 vehicles of different types cross this point each hour (in either direction) during both morning and afternoon, which include about 200 trucks, pick-up and freight vehicles. The project proponent has estimated that about 325 trucks will travel to and from the river terminal in 24 hours through the Ponchoboti-Muktharpur road during its operational phase. The incremental traffic to be generated by the proposed project is significant. Additionally, other ongoing development activities in the surrounding area will further deteriorate the traffic and road condition. Renovation and expansion of the Ponchoboti-Muktharpur road is urgently needed for the greater interest of the area. The Government is planning to initiate a project for the expansion of this road. During field surveys in August 2014 by BCAS, it was observed that up gradation and expansion works of the road has been initiated and has progressed significantly.

In spite of up gradation of the access road there is requirement by SAPRL to regulate the incoming and outgoing traffic from the project area by:

1. Staggering the inflow and outflow of traffic. The container trucks carrying outward cargo should be allowed to unload during the first half of the time allowed for truck movement and the trucks loading with inward cargo should be allowed in the second half. This will ease congestion on the access road.
2. Maintaining time of loading and unloading of the container trucks optimizing time to the extent possible. This will add flexibility to the overall traffic management.
3. Control through mobile phone communication with drivers of incoming and outgoing trucks for better management of road traffic to avoid congestion on the access road due to the activities of the river port operations.

5.3.4 Air Pollution

During the operational phase, the sources of environmental pollution can be categorized into three groups

- the diesel vehicles (trucks) carrying goods to and from the container terminal,
- the container handling equipment (e.g., Cranes, Reach Stacker and Forklifts) which are mostly run by diesel engines port (2000 kVA capacity) for electricity supply at the terminal.
- There may be minor emissions from diesel fuel storage also.

Estimation of emission generated during operation phase is closely related to this pattern of equipment use. During the full operation 325 trucks per day will be needed to handle the goods of 120,000 containers in a year. The trucks are estimated to be spending 10-12 minutes of running operation in the container terminal and running time in the connecting road from the site to the main road at an average speed in the order of 10 km/h. Table 5.4 shows the various equipment which will be in operation and will be considered in assessing the impact on air quality using the air dispersion modeling.

Table 5.4: Various items with their quantities and operation at the proposed SAPLRT

Item	Quantity
No. of Barges	4 /day
No. of Containers	1,20,000 /year
	400 /day
Trucks (100 kW, diesel fueled)	325 /day
Crane (FCC) (195 kW, diesel engine operated)	2
Reach stacker (257kW, diesel engine operated)	1
Fork lift-5t (64.7 kW, diesel engine operated)	1
Fork lift-3t (battery operated)	2
Diesel generator(2000 kVA)	1
Fuel storage tank	2000 litres

5.3.5 Air Dispersion Modeling

As per terms of reference provided by IDCOL air dispersion modeling needs to be done. The activities at the proposed project will be intermittent in nature with the generators and the handling equipment being operated as and when required. In order to make the most conservative estimate it will be assumed that all the equipment will operate 24 hours a day.

Model Selection

Though, according to USEPA (www.epa.gov/scram001/7thconf/aermod_mep.pdf), AERMOD and ISC-PRIME had a similar evaluation outcome for the full year Bowline Point data, featuring buoyant steam electric plant releases, with no significant differences in model performance, AERMOD model, version 09292, has been selected for this study as it is currently the preferred model

AERMOD is a steady-state plume model. In the stable boundary layer (SBL), the concentration distribution is assumed to be Gaussian in both the vertical and horizontal. In the convective boundary layer (CBL), the horizontal distribution is assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (p.d.f.). Additionally, in the CBL, AERMOD treats “plume lofting,” whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the CBL. AERMOD also tracks any plume mass that penetrates into elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate.

5.3.6 Modeling Methodology

1. Model Setup

AERMOD was used with the following setup:

- a) A model domain of 7.5 km by 7.5 km centered on the stack (0.0, 0.0) and 500m grid spacing's using Cartesian Co-ordinates.
- b) Assumption of no terrain as the site surrounding the proposed plant is essentially flat with no hilly areas.

- c) Surface roughness lengths between 0.1m and 0.3m depending on the seasons were used to account for the primary flows of concern across relatively flat areas.
- d) Building wake effects were not included as the heights of the nearest buildings were not sufficient to influence emissions.

2. Meteorological data requirement

The meteorological data used in the dispersion model is of fundamental importance as it drives the transport and dispersion of the air pollutants in the atmosphere. The most critical parameters are wind direction, which determines the initial direction of transport of pollutants from their sources; wind speed, which dilutes the plume in the direction of transport and determines the travel time from source to receptor; and atmospheric turbulence, which indicates the dispersive ability of the atmosphere.

All meteorological stations used to collect data for dispersion modeling purposes must use an anemometer that has a stall speed of 0.5 m/s or less.

For the AERMOD dispersion model, two meteorological files (surface file and profile file) are needed. The meteorological parameters required for the surface file are:

H = sensible heat flux (W/m^2)

u^* = surface friction velocity (m/s)

w^* = convective velocity scale (m/s)

VPTG = vertical potential temperature gradient in the 500 m layer above PBL

Z_{ic} = height of convectively-generated boundary layer (m)

Z_{im} = height of mechanically-generated boundary layer (m)

L = Monin-Obukhov length (m)

z_o = surface roughness length (m)

Bo = Bowen ratio

r = Albedo

Ws = wind speed (m/s)

Wd = wind direction (degrees)

zref = reference height for Ws and Wd (m)

temp = temperature (K)

ztemp = reference height for temp (m)

The meteorological parameters required for the profile file are:

height = measurement height (m)

top = 1, if this is the last (highest) level for this hour, or 0 otherwise

WDnn = wind direction at the current level (degrees)

WSnn = wind speed at the current level (m/s)

TTnn = temperature at the current level (°C)

SAnn = F2 (degrees)

SWnn = Fw (m/s)

The data files (both) should include hourly average values for the above parameters.

Wind speed, wind direction, ambient temperature, cloud cover, solar radiation, pressure, relative humidity and precipitation rate can be directly measured, but other parameters need to be determined indirectly using other meteorological parameters with empirical formulae.

Preparation of meteorological data

1. Friction velocity, Monin-Obukhov length and surface roughness length

Surface characteristics in the form of albedo, surface roughness and Bowen ratio are standard values depending on the season. Standard meteorological observations (wind speed, wind direction, temperature, and cloud cover) for the site have been procured from the Bangladesh Meteorological Department (BMD) and are used to calculate the PBL

parameters: friction velocity (u^*), Monin-Obukhov length (L), convective velocity scale (w^*), temperature scale (θ^*), mixing height (z_i), and surface heat flux (H) These parameters are then used to calculate vertical profiles of wind speed (u), lateral and vertical turbulent fluctuations (v , w), potential temperature gradient (d/dz) (www.weblakes.com/guides/aermod/sec3/3_1_4.html). *Meteorological data period: 1st December 2011 – 30 November 2012.*

5.3.7: Background air quality data and wind roses for 4 months

To facilitate collection of background air quality data taking wind direction into consideration, four wind roses for the year 2013 are given in figures 5.1 (January), 5.2 (April), 5.3 (July), 5.4 (October). The following figures are the Wind roses based on Time.

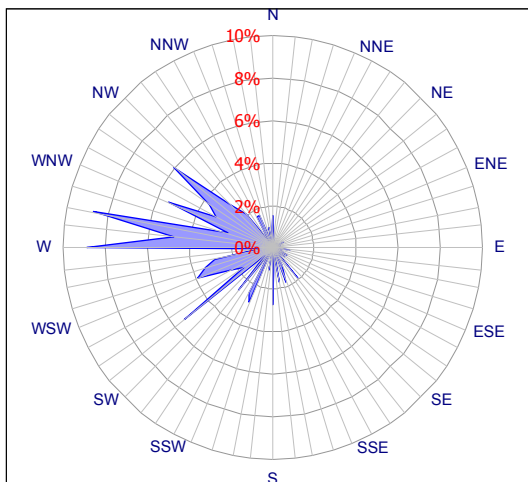


Fig.5.1: NOx Wind rose for January 2012

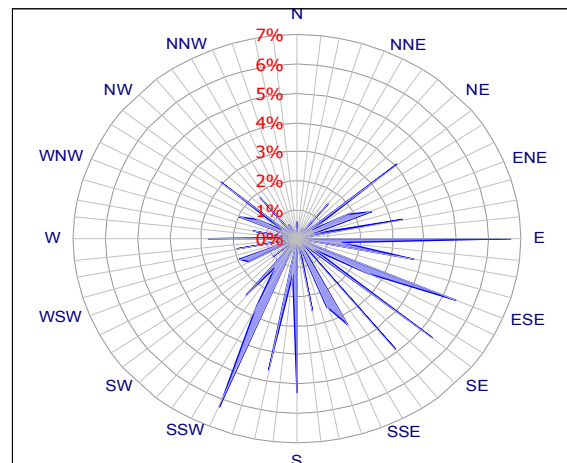


Fig. 5.2: NOx Wind rose for April 2012

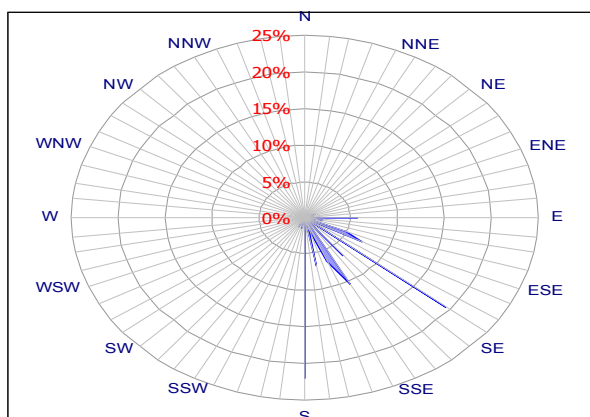


Fig.5.3: NOx Wind rose for July 2012

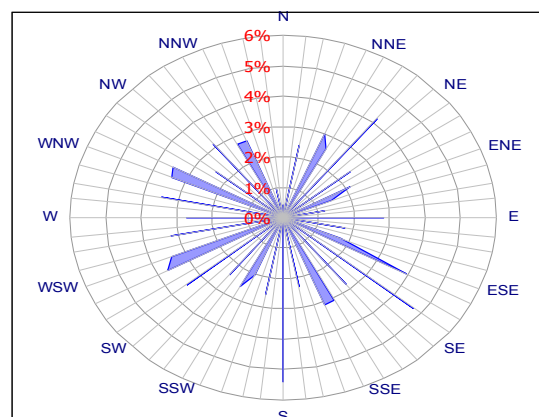


Fig. 5.4: NOx Wind rose for October 2012T

Baseline Air Quality data

The measured baseline data collected in August 2014 is shown in Table 5.5

Table 5.5: Measured baseline concentrations of Pollutants.

Pollutant	Background concentration ($\mu\text{g}/\text{m}^3$)
NO ₂	6.90
CO	5.40
PM ₁₀	219.10
SO ₂	15.80

Modeling results

Maximum 50 values for SO_x, NO_x, PM₁₀ and CO are presented in Tables 5.6 and Table 5.7 shows the combined ground level concentrations as percentage of Bangladesh standards.

Table 5.6: Project highest concentration ($\mu\text{g}/\text{m}^3$)

Pollutant	Project highest concentration ($\mu\text{g}/\text{m}^3$)
NO _x	1.58
CO	1.81
SO _x	12.62
PM ₁₀	0.08

Table 5.7: Ground level concentrations

Pollutant	Averaging Period	Air Quality Standard ($\mu\text{g}/\text{m}^3$)	Baseline Concentrations ($\mu\text{g}/\text{m}^3$)	Model Prediction Values ($\mu\text{g}/\text{m}^3$)	Combined Values ($\mu\text{g}/\text{m}^3$)	% of Bangladesh Standards
NOx	24 hours	100	6.9	1.58	8.48	8.48
SOx	24 hours	365	15.8	12.62	28.48	7.80
CO	8 hours	10,000	5.4	1.81	7.21	0.0721
PM10	24 hours	150	219.1	0.08	219.18	146.00

The above results show that except for PM10 the other pollutants NOx, SOx and CO are well within the Bangladesh standards. The high baseline concentration of PM10 is due to the large number of industries in the area especially the cement industry in close proximity to the proposed project.

It may be mentioned that ADB, IFC and World Bank accepts the compliance to standards set by individual countries. The ECR 1997 provides standards for ambient air quality for Bangladesh.

5.3.8: Noise Pollution

During the operation phase, noise will be generated due to the operation of the generators, pumps, engines of boats and ships, cranes for handling of goods, cargo and shipment vehicles. Noise will also be generated from the warehouse, repair and maintenance block, service area, goods loading and unloading points. Activities like container handling, container stacking, periodic dredging, vehicle movement on internal road, etc. will also contribute to increasing ambient noise levels. However, the main effect on the environmental noise level will be from increased transportation of goods entering and leaving the port. The bulk cargo is anticipated to be moved by truck which could result in movement of 325 trucks per day during the full operational phase of the

river terminal.

The level of noise generated by the operation of port machinery and transportation vehicles is usually within 70~95 dB(A). The noise level varies depending on the condition of operation. Table 5.8 shows the major sources of noise at 1m distance from the equipment:

Table 5.8: List of Equipment Planned to be Used during Operation Phase

Equipment	Noise Level in dB(A)	Quantity	Remarks
Forklift truck	70	10	At container freight station
Container crane	85	2	Fixed at jetty
Container reach-stacker	80	2	Mobile machinery within yard
Genset in canopy	75	1	Fixed at jetty side
Traffic (Truck)	75	325	

As the project site and its neighborhood are industrial in nature and there is no environmentally sensitive area close to the site, the impact of the noise generated by the project on the quality of surrounding acoustic environment is limited.

To reduce the impact of traffic noise on surrounding acoustic environment, a number of measures have been proposed under the environmental management plan (EMP), presented in Chapter 10. If these measures are taken and implemented, noise level within the project boundary is likely to satisfy requirements of the Bangladesh standards as well as of Grade III Standards as indicated in *Standard of Noise at Boundary of Industrial Enterprises* (GB12348-90), and that noise level will not cause significantly adverse impact on the quality of acoustic environment adjacent to the project site.

5.3.9 Noise impacts and modeling

The noise modeling is based upon the method documented by the International Energy Agency. It is a simple model which assumes spherical spreading from a point source either in free space (spherical) or over a reflective plane (hemi-spherical). For this case, spherical spreading has been used because sound wave is propagating uniformly in all directions and the crests and troughs of the sound waves can be pictured as spheres centered on the source location. The total noise from each turbine is logarithmically added according to the formulae given below:

$$L_A = 10 \log_{10} (10^{L_{A/10}}) \text{ dBA}$$

Where: L_A = Sound Source 1 (i.e.SAPLRT)

The model presents a 'worst-case scenario' as it does not take into account factors which would reduce noise propagation, such as:

- Uneven topography
- Large obstructions in the propagation path, e.g. barriers etc
- Refraction of noise, e.g. due to atmospheric effects such as temperature inversion
- Wind speed or direction effects
- Any change in the propagation with changing frequency
- The baseline noise level is conservatively assumed to be 85 dB at 1m distance from the equipment.

The mathematical formula for the noise model is shown below:

$$L_P = L_W - 10 \log_{10} (2m^2) - ar$$

$$L_P = L_W - 10 \log_{10} (4m^2) - ar$$

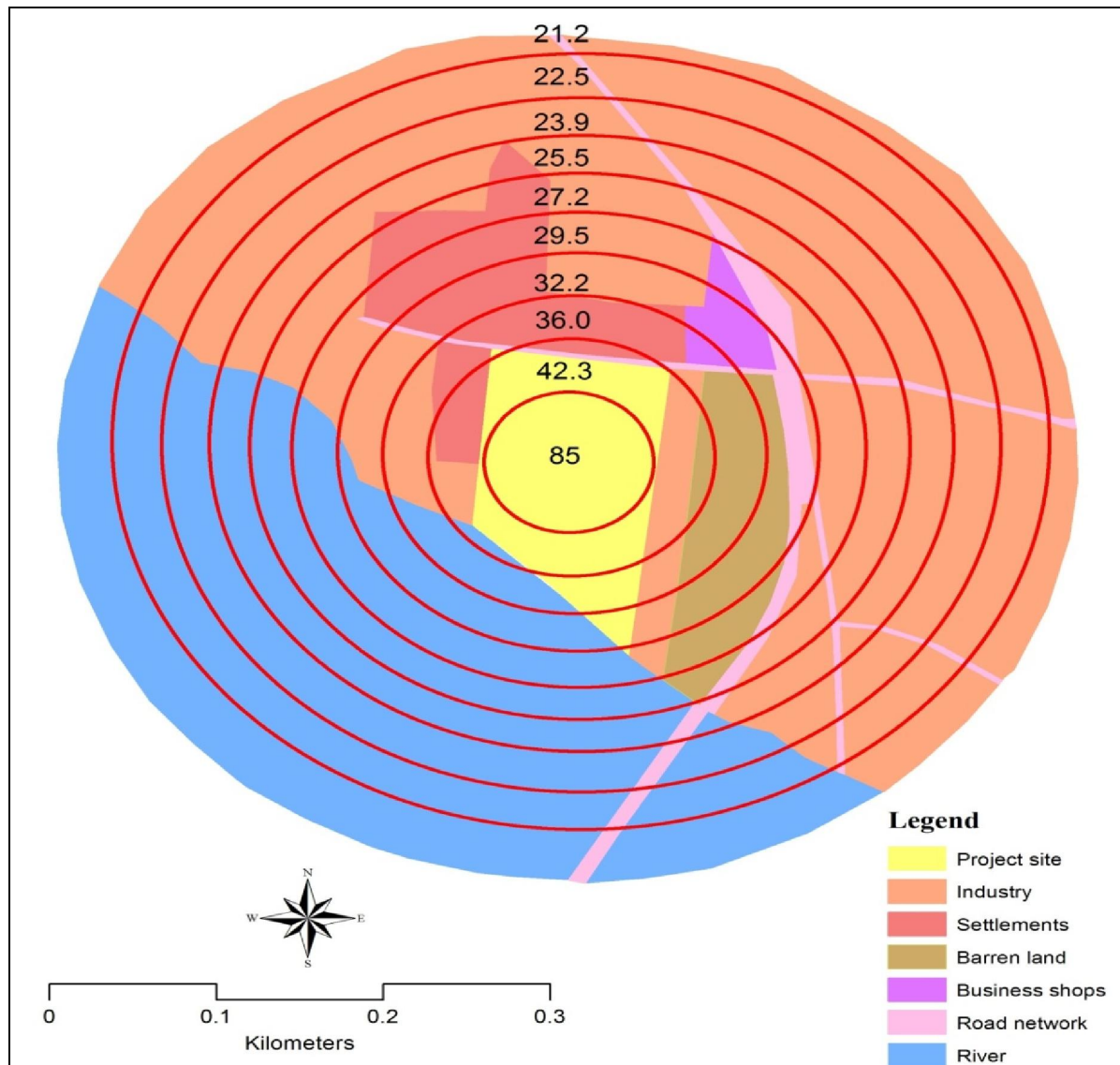
Where: r is the distance from source to receiver;

a is the absorption due to the atmosphere (dB/m), which is most commonly used as 0.005dB/m;

L_W the sound power level of the turbine; and

L_P the output sound power level of the turbine at different radius away from the source.

Graphic User Interface (GUI) software was built based upon the model using MATLAB programming language for enhancement in calculation and analysis. The noise dispersion pattern in the project area is shown in Map 5.1. The distance between consecutive concentric circles represents a distance of 50 meters. The nearest household receptors within 100 meter radius will be exposed to 32 to 42 dBA which is within the acceptable limits set by the DOE.



Map 5.1: The map showing predicted noise level in dBA within a radius of 500m of the project site

5.3.10 Noise Modeling Results

At 85 dB noise input (for each Engine), the predicted noise output is as follows:

Radius (m)	1	50	100	150	200	250	300	350	400	450
Predicted Output Noise level in dB	85	42.3	36.0	32.2	29.5	27.3	25.5	23.9	22.5	21.2

Table 5.9

The relationship between the adjacent area and noise level are presented in the above Map 5.1. However, there is a settlement on the west side of the project which is about 50 meters from the project boundary wall. The noise predicted noise level is 42.3dB but the baseline is higher and which becomes dominant. On the east side of the project there is the access road is road and bridge where the baseline noise level is dominant and the noise generated from the project will not impact the noise level. On the south side is Dhaleshwary river where the impact due to noise will be negligible as the settlements and receptors will be more than 500 meters. In the north side of the project is Ideal Textile Mills who has their own generation of noise and the noise levels predicted from the proposed project will not impact the noise level. Overall there will be incremental impact due to noise for the proposed project activities.

The ambient noise standard of IFC and Bangladesh Government is mentioned in the following Table 5.10 and 5.11

Table 5.10: Standards of noise level

Standard	Zone	Day time dBA	Night time dBA
World Bank EHS Guideline 2007	Residential, institutional, educational	55	45
	Industrial, commercial	70	70
Bangladesh ECR, 1997	Mixed area	60	50
	Commercial	70	60
	Industrial	75	70

Table 5.11: The combined noise levels at locations in the Vicinity of the Site based on modeling at various distances from the project location

Location	Approximate distance from the Source (m)	NIGHT dB(A)			DAY dB(A)		
		Baseline	Source Sound (estimated from simulation)	Combined effect	Baseline	Source Sound (estimated from simulation)	Combined effect
Project site (east boundary point)	105	41.2	29.33	42.75	47.06	29.33	48.46
North side of the port	223	37.3	18.91	38.57	43.76	18.91	44.93
South side of the port	208	41.3	28.07	42.74	48.23	18.07	49.48
East side of the port	207	42.4	37.60	44.04	49.65	25.90	50.06
West side of the port	175	37.5	26.23	38.91	37.41	26.23	38.82

Table 5.11 shows the combined effect of the resultant sound at various points where the baseline noise levels were measured. The combined effect is a sum of the baseline value and log of model results at various distances from the source of the noise the four directions during night time and day time

Based on the results in Table 5.11, it is clear that the proposed River Terminal Container Depot at West Mokterpur, Munshigonj will have a negligible impact on the noise environment at the nearest sensitive receptors. Such an increase is considered to be negligible and is complying with IFC guidelines. The model presents a 'worst-case scenario' as it does not take into account the normal abatement techniques to be used.

5.3.11 Solid waste

During operation phase, solid waste will be generated from production process i.e. oil filter, air filter, scrap tires, batteries, other wastes of maintenance workshop and from kitchen and Project personnel daily uses. Improper disposal of solid waste may interrupt the drainage system as well as may pollute the surface water body.

SAPLRT has to confirm the compliance of good house-keeping policy and procedure. Personnel should be trained accordingly. Two separate waste bins should be placed to collect the daily waste as organic and inorganic. All plastic materials would be sold to DOE enlisted secondary users for recycling. Biodegradable waste could be compost and later use as fertilizer.

It is already mentioned that SAPLRT is found to consider the waste management issue with due importance. Already they have introduced a number of dustbins including the approach of separating the waste at source.

5.3.112 Liquid waste and lube oil disposal

Main liquid waste of the proposed port seems to be lube oil. So, there is possibility of oil spillage during the following incidences:

- oil spill during unloading from tankers;
- leakage from storage tanks;
- leakage from transfer pipes;
- leakage from machines during operation; and
- oil spill during maintenance of machines.

Spillage of oil will be collected in a tank and pass through three tanks and finally send to the process where a polymer will be added to separate the oil from water. The separated oil will be collected in drums and sold to DOE approved recyclers. SAPLRT will not procure poly-chlorinated biphenyls (PCBs) transformer oil. Pure hydrocarbon mineral oil will be used for transformers, current transformers, potential transformers and capacitors under the project which will not have any adverse environmental impacts.

5.3.13 Sanitary waste-water

Sanitary wastewater will be generated from the office and dormitory building, which will be treated by septic tank connected with soak pit. SAPLRT has informed that they are will adopt septic tank and soak pit by considering the required standards of best practices as are applicable for 100 persons.

5.4 Environmental Impacts during Decommissioning Phase

The major environmental impacts during post-operation or decommissioning phase of a Container Depot are noise and vibration; solid waste generation and leakage of spent lube-oil and other raw materials; dust generation; and risk of human health and property. As the demolition workers are likely to lead to significant deterioration of the acoustic environment, carrying out the demolition work at day time can be a mitigation measure. In case of waste and leakage of spent lube-oil and other raw materials, SAPLRT has to make sure proper collection and disposal. To address the dust generation due to demolition work, watering in bare area can be an option. For mitigating the risk of human health and property damage, vehicles as are to be used in demolition work, have to be operated with due care

5.5 Occupational Health and Safety Impact

Occupational health and safety risks and mitigation measures during construction, operations are similar to those of other large industrial facilities. According to Environment, Health and Safety (EHS) Guidelines of IFC, the major occupational health and safety issues relevant with the Project are as follows:

5.5.1 Exposure to Electro Magnetic Field

In a port, the workers have a high exposure to electro-magnetic field (EMF) than the general public due to working in proximity to electric power generators, equipment and connecting high-voltage transmission lines. SAPLRT has planned to provide earthing network around the generator room. Mesh system is expected to be used as safety measure.

5.5.2 Fire and Explosion Hazards

The daily activities of port include store, transfer and use large quantities of fuels; therefore, careful handling is necessary to mitigate fire and explosion risks. To avoid the risk of fire and explosion hazard, SAPLRT has to arrange sufficient number of fire protection equipments like buckets, fire extinguishers, fire water tank should be provided for emergency needs. At the site, the safety and emergency manual should be accessible to all employees.

5.5.3 General Safety

To reduce the risk of general accidents, SAPLRT has planned to provide personal protective equipments like safety gloves, helmet, mufflers etc. during construction period and during the maintenance work while the port is in operation.

Chapter-6

ANALYSIS OF ALTERNATIVES

6.1 'No Project' Alternative

From physical and environmental points of view, the 'do-nothing' is preferable to any project implementation, since it would avoid creation of any of the adverse impacts associated with the project. But the 'without project alternative' is not acceptable since this will strongly reduce the potential for socio-economic development of the country. In spite of having greater potentiality, the industrial growth is retarded mainly due to timely transportation from the production point to port and extra transport cost. River port is the easiest way to carry the goods from Chittagong port to Dhaka and Dhaka to Chittagong. Considering these, SAPL has decided to ahead with the project.

Therefore, it is concluded that the 'No Project' alternative is not an option.

6.2 Analysis of Technology

The technology used in the operation of the project is not highly specialized and will include Fixed Cargo Cranes (FCC), Reach Stackers, Forklifts, and other handling equipments.

Fixed Cargo Cranes (FCCs) are fitted on fixed pedestals on the quaysides and jetties (see Fig. 6.1). The FCC cranes can be executed in various designs and are strategically positioned on quaysides for efficient loading and unloading of vessels.

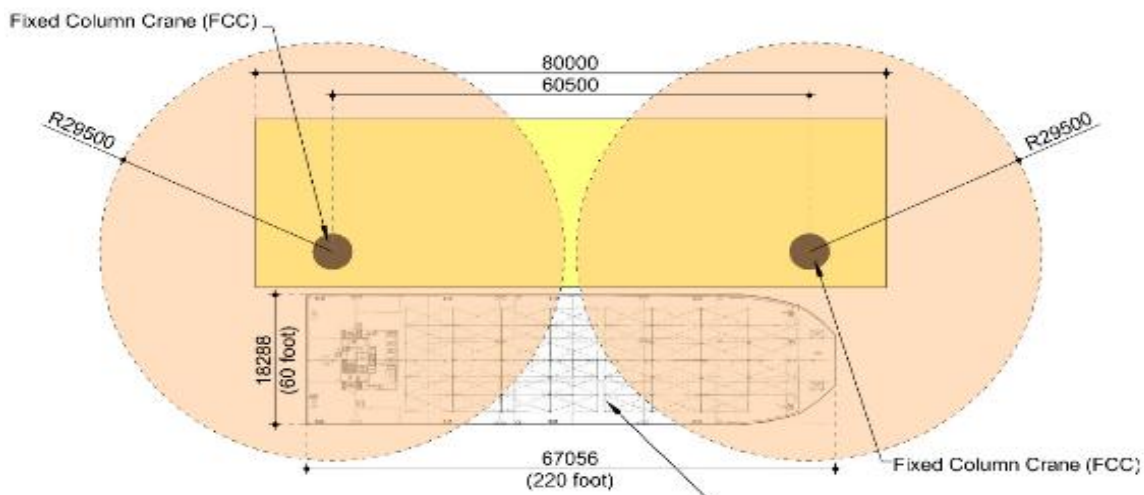


Figure 6.1: Overview quay structure - outreach of Fixed Cargo Cranes

Reach Stackers are used for flexible handling of containers and are usually designed to lift containers as heavy as 45 metric tons into heights of six containers. Reach Stackers are able to transport a container over a short distance very quickly and pile those rows as required. The straightforward operation of loading and unloading do not have any technology alternative.

6.3 Analysis of Site Alternatives

Analysis of Site Alternatives (AoA) helps to identify potentially viable project locations and provide comparative cost, effectiveness, and risk assessments of each site to a baseline; this baseline is typically the proposed operating system.

In identification of project site for a River port terminal depot, some parameters are taken into consideration like:

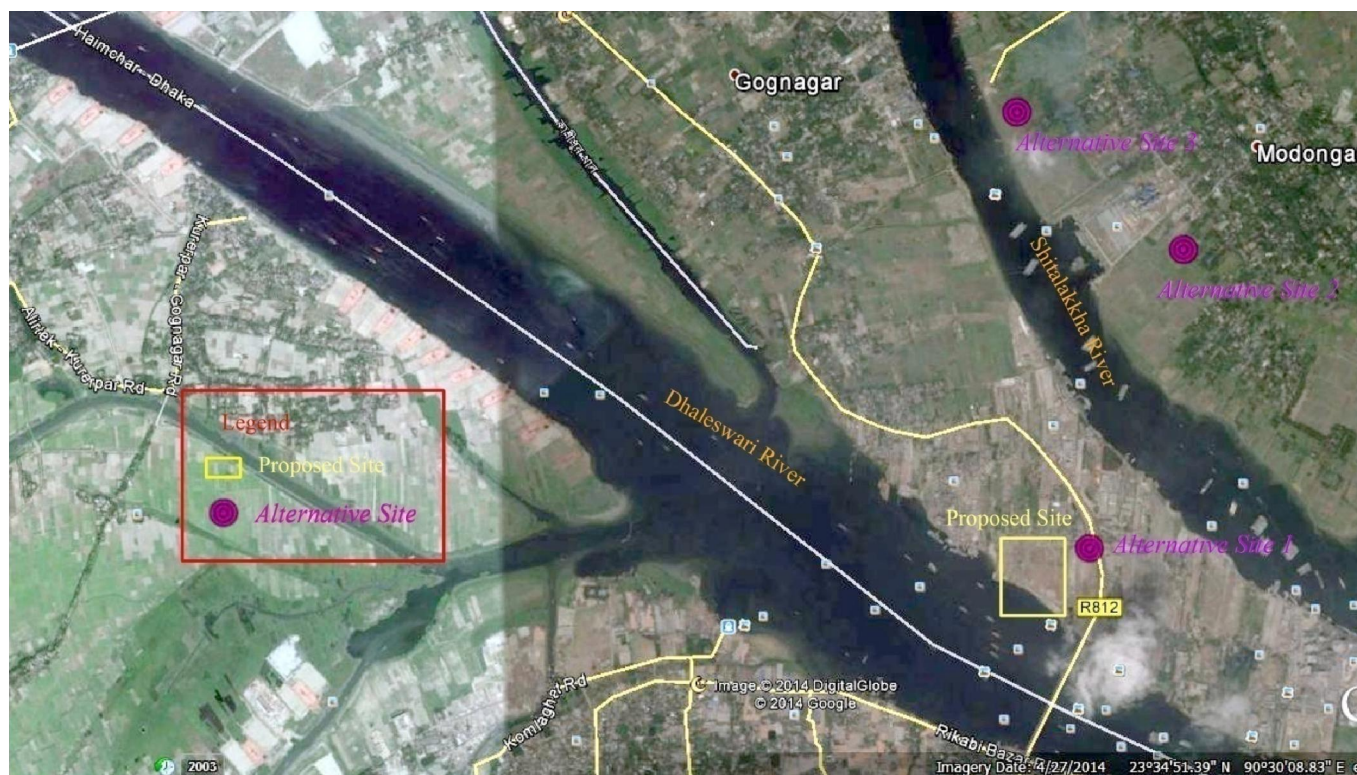
- i) availability of river navigation in terms of adequate draft all round the year
- ii) availability of adequate river front space for the river port,
- iii) availability of fuel transport facility through sea and road,
- iv) availability of infrastructure facility (electricity, telecommunication, etc).
- v) availability of land transport parking spaces etc.
- vi) availability of wide road connection to carry the container by road
- vii) environmental and social suitability

6.4 Location and Area of Available Land

During site visit, information about alternative sites considered was assessed. Based on the available information two alternative sites were selected for further analysis. Table 6.1 and in Google Map 6.1

Table 6.1: Comparison of sites with respect to location, area and communication

Site	Physical Location		Ward	Geographic location		Area in acre
	Mouza	Union/pourasava		Latitude	Longitude	
Proposed site	West Mukterpur	Panchaser	8	23°34'28" N	90°30'43" E	14.5
Site-1	West Mukterpur	Panchaser	8	23° 34' 26.09" N	90°30' 50.23"E	7.5
Site-2	Madanpur	Narayangonj	12	23° 34' 26.33" N	90°31'57.78"E	12



Google Map 6.1: Two alternative sites view for the alternative port indicated in the above image



Photo 6.1: North side for Alternative site 1



Photo 6.2: East side for Alternative site 1



Photo 6. 3: North side for alternative site 1



Photo 6.4: South Side for alternative site 1



Photo6. 5: South side for alternative site 2



Photo 6.6: North side for alternative site 2



Photo 6.7: West side for alternative site 2



Photo 6.8: East side for the alternative site 2

Table 6.2: Comparison of sites with respect to communication and other suitability

Location	Topography	Land use pattern
Proposed site	▪ The site is basically a plain terrain. ▪ The site requires about 3-4 feet land filling. ▪ The overall shape of the site is rectangular making it more suitable for a river port container terminal ▪ The site is situated on the offshore land of Dalesswary river. ▪ Road connectivity from Dhaka to project is good ▪ River connectivity from Munshigonj to Chittagong and other places is good ▪ The place is outside from the settlement	Prepared land for any kind of industrial activities
Alternative Site-1	▪ The site is basically a plain terrain. ▪ The site requires about 5-6 feet land filling. ▪ The overall shape of the site is rectangular making it more suitable for a river port container terminal. ▪ Wide vacant land close to the Sitalkkha river ▪ Ship movement and container handling activities can be done easily ▪ River and road connectivity is good ▪ Having open space around the project site for keeping truck and lorry	Prepared land for any kind of industrial activities
Alternative Site-2	▪ The site has moderate a plain terrain ▪ There are some natural wetlands in the site ▪ The site requires about 5-7 feet land filling ▪ This site is not near to the river for freight handling ▪ This site is not suitable for the river port container depot ▪ Having open space around the project site for keeping truck and lorry	Vacant land and earth filling is ongoing

6.5 Distances from Major Infrastructure

While selecting a River Terminal Container Depot site, distance from major infrastructure is important consideration. Because of construction of Jetty and crane supporting basement and river training, requires considerable amount of financial involvement and sophisticated technology. As the proposed project will be an export import oriented materials load and unload from the Chittagong and other port, proximity to container depot facility is also a major issue to deal with. In the following **Table 6.3**, the sites are evaluated based on distance from some important infrastructures.

Table 6.3: Comparison of sites with respect to distance from major infrastructure

Sl. No	Major Infrastructure	Approx Distance from Site (km)		
		Proposed Site	Alternative Site-1	Alternative Site-2
1	Upazila office of Munshigonj and Narayangonj	2.0	5	6
2	PDB office	2.0	3	4
3	Narayangonj bus stand	3.75	4	5
4	BIWTA	3.0	6.0	7
5	LGED office	4.0	2.0	3.75
6	Zila parishad office	3.0	5.0	6.75
7	Hospital and clinic	3	5	6
8	Fire service	1.25	4	5
9	Union parisad	4.25	5.25	6.0

Source: BCAS field representative through local information

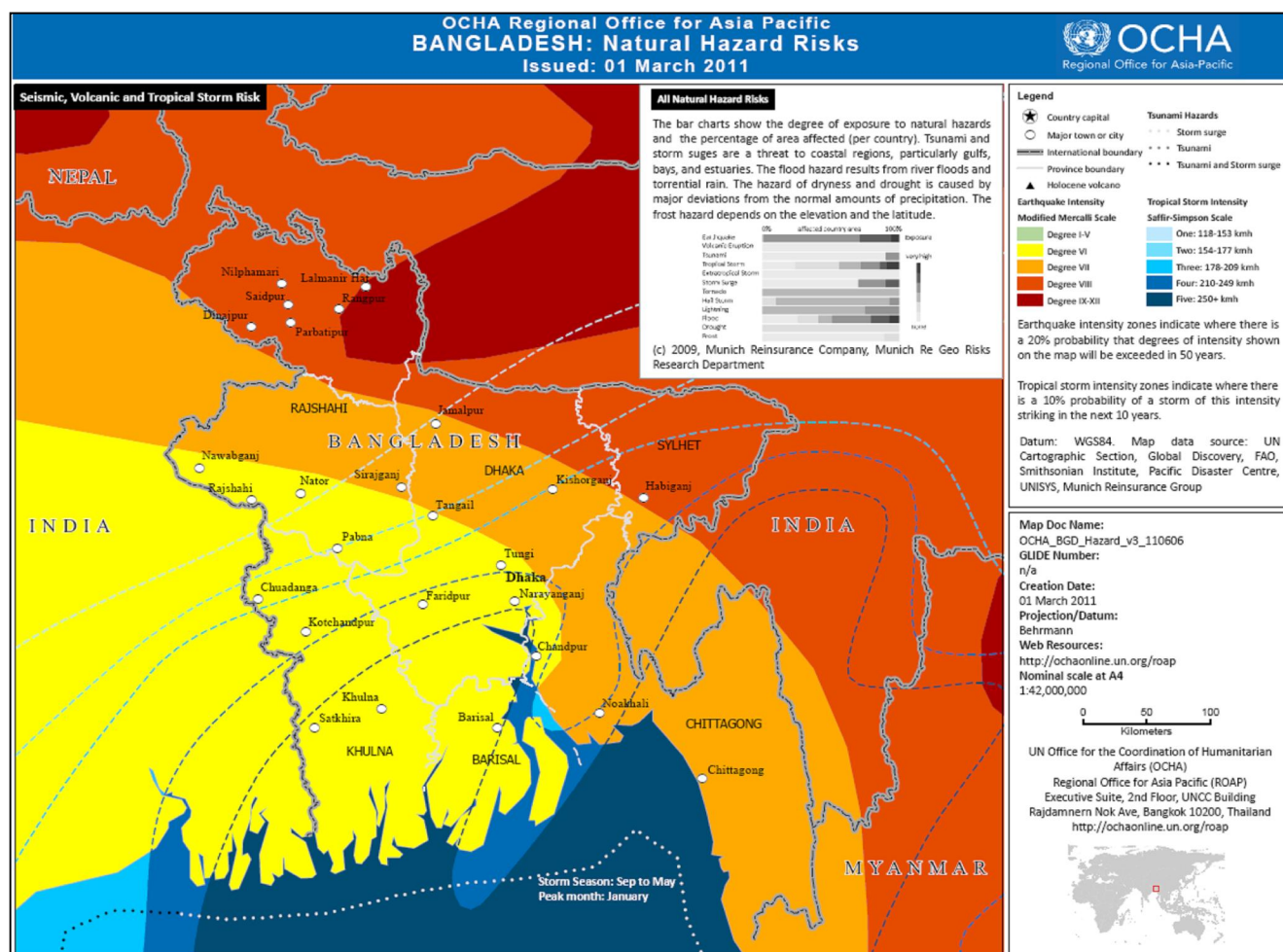
The analysis shows that even the alternative locations size and area is adequate for the proposed river port container terminal but for the following reasons the proposed SAPLRT project by the sponsors seems to be the most advantageous and suitable.

- Close proximity to the riverside
- No natural wetlands will not be disturbed
- Close proximity to the main road for transportation of construction equipments
- Proximity to natural gas pipeline and electricity connection

- Land filling requirement will be less and the area is more suitable for a river Terminal

6.6 Vulnerability to Natural Calamity

According to the earthquake zoning of Bangladesh the three sites have fallen under Zone II, which means that the sites have moderate risk of earthquake. On March 1, 2011 UN Office for the Co-ordination of Humanitarian Affairs (OCHA) published a composite map of vulnerability to natural calamity for Bangladesh. According to this map, the sites have less significant risk associated with Tsunami and storm surge. But the tropical storm intensity is about 210 kmh. There is no risk of volcanic eruption for these sites. According to this map earthquake risks for the three sites is Degree VI according to the Modified Mercalli Scale. The following Map 6.2 depicted the Natural Hazard Risk of Bangladesh.



Map 6.2: Natural Hazard Risk Map of Bangladesh prepared by OCHA

6.7 Environmental and social aspects

There are two major components in safeguards aspects. They are environmental and social issues. In this section the sites will be evaluated based on some project specific environmental and social parameters. The shortlisted three sites have been compared with respect to environmental and social aspects.

6.8 Comparative Valuation of the Proposed Sites

Land price is dependent on a number of factors. Among this factors accessibility to the site and proximity to major infrastructure are two major factors. Similarly the land rate was found to vary from site to site. The price of road side land is high than the river side land. The location of the proposed project is covered both the road and river, therefore the price is comparatively high and suitable for the river port terminal. The other two sites also suitable and the location is riverside which price is less than proposed site but it is not prepared land, it would take time. BCAS team discussed the local people for sites evaluation. **Table 6.4**, the tentative unit price of three sites is evaluated.

Table 6.4: Land price of short-listed sites Add proposed land price

Site	Market price (taka/decimal)
Proposed site	500,000
Site-1	450,000
Site-2	400,000

Source: BCAS representative

Chapter-7

INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

7.1 Information disclosure

During baseline survey an information disclosure about the project was carried out in the project area. The approach was based on a combination of formal, informal meetings, key informant interview (KII) and focus group discussions (FGDs). The formal meetings were held through prior notice and invitation of the households, district administration, local administration, Civil Defense Fire Service, Bangladesh Inland Water Transport Corporation, Fisheries Office, TNO, local member etc. The following groups identified for disclosure:

- Project Affected People
- Government agencies connected with the project
- Local elites and academicians of the area
- Closest households and commercial institutions of the project site
- Local NGOs working in the area

The methodology used for the disclosure process was as follows:

- Preliminary Informal meetings with various categories of people and households were completed
- Several formal meetings specifically including all categories of People in the project site
- One large public consultation meeting which included all the peoples, representatives from the project impacted areas, district and local administration, as well as other community representatives including prominent local people, lawyers, journalists and academicians.

7.2 Stakeholder's Consultation

The objectives of the consultations were as follows:

- dissemination of information about the project among the stakeholders;
- have a better understanding of existing environmental conditions and their concerns;
- aware stakeholders to contribute meaningfully to in different phases of project;
- reduce psychological distance between project sponsor and stakeholders; and
- ensure the sustainability of the project.

Stakeholder consultation meeting is an important part of the ESIA study. The main objective of the consultation meeting is to apprise the local inhabitants about the Proposed Project and to seek their opinion regarding the tentative impacts. It is a fundamental principle of any environmental assessment study. The inclusion of the feedback of public consultation helps to ensure that the decision making process is equitable and fair and leads to more informed choice and better environmental outcomes. The findings from the public consultations carried out as a part the ESIA study were utilized in the development of the EMP, especially in identifying the significant impacts of the proposed project and developing the corresponding mitigation measures.

7.3 Consultation and Participation Mechanism

Public consultation has been carried out during different activities in the Project cycle, using different techniques such as public meeting, small group meeting, informal meeting as per social environment and procedures of BCAS. During the consultations the stakeholders were informed about the project in general and in particular about the following:

1. Finalization of the Project plan.
2. Summit Alliance Port Limited River Terminal (SAPLRT) design standards in relation to the applicable international standards.
3. Environmental and Social impacts due to the project and mitigations suggested in the draft ESIA.

4. Health Impacts and their mitigation as part of the Environmental Management Plan (EMP).
5. Measures taken to avoid public utilities and other social infrastructure such as school, hospital, roads, etc as well as to generate employment opportunities, and assist with the development of a small enterprise.
6. Other impacts associated with Access Road with an approach to minimize and mitigate the effects of increased traffic due to the project.

7.4 Stakeholders' Participation

A series of public consultation activities were undertaken by BCAS representative. These included rapid appraisal and discussion with the groups of Project Affected People and community leaders. Exchange the opinion with the local people, knowing individual perception. Results of Stakeholders consultation through KII and FGDs are given below:

1. KII with the Thana Nirbahi Officer (TNO)

Mrs. Saraban Tahura

Thana Nirbahi Officer, Munshigonj Upazila Sadar, Munshigonj

Date: 31 August, 2014

Cell No.: 01927 432 442

According to the local government structure of Bangladesh Government, West Mukterpur is a village of Panchaser Union under the jurisdiction of Munshigonj District. The administrative authority of the village is the Upazila Parishad. As a part of consultation with local government representative, there were consultations with Mrs. Saraban Tahura, Thana Nirbahi Officer (TNO).

The following were the discussing issues:

The interviewee was aware about the proposed River Terminal of SAPLRT at West Mokterpur which will be established by Summit Alliance Group

The interviewee raised concerns about the existing high particulate matter concentration in the area and recommended that the proposed project should ensure

that no further particulate matter is created by the proposed project. Concerns about oil spillage was raised and hoped that proper emergency response to tackle any accidental spillage should be in place.

Incremental movement of container trucks movement through the present road and river traffic due to the project. The access road needs to be widened and upgraded to ensure smooth traffic movement. A traffic management plan needs to be in place. For incremental river traffic permission from the BIWTA is required.

There was concern about noise pollution in the close proximity of the settlement area in the west side of the proposed project may be affected by high noise levels because of port activities.

The interviewee suggested that the project should employ local people in the port on a priority basis provided they have the required skills.

The project sponsors should ensure timely completion of the access road.

2. Key Informant Interview with Civil Defense (Fire Service) of Narayangonj district

Mr. ABM Momtaj Uddin

Deputy Assistant Director

Civil Defense, Narayangonj and Munshigonj

Date of Interview : 27 August 2014

Cell No.: 01711577451

BCAS Field Research Team conducted an interview with the Civil Defense Fire Service of Narayangonj District regarding the Environmental and Social Impact issues by Summit Alliance Port Limited River Terminal (SAPLRT) on 27th August 2014 at the Fire Office



of Narayangonj. He expressed that:

Such kind of port will help in the growth of countries economy through creation of job and business opportunities of the people but there will be some impact on sound when the ship will harbor at the port and when leave the port.



The project has various kind of hazards like electricity hazards, fire hazard, vehicle accident hazard, water quality changing hazard, air quality changing by smoke and other parameters. All kind of hazards are harmful for the human health and basically will be affected the nearest settlement directly. As we are the concerned agency for fire fighting the project activities has to follow our rules and regulations. The department has training option if the company requires. The department will periodically check the condition of the firefighting equipment. The project personnel should be aware of the telephone numbers of the station so that quick communication can be established in case of fire emergencies. They suggested that the company should arrange the fire safety training of the in-house staffs so that they can readily use during the disaster.

3. Key Informant Interview (KII) with Local Union Parishad Member

Mr. Khokan Mia

Union Parishad Member, West Moktrpur, Munshigonj

Date: 26 August 2014

Cell no.: 01915688193

Mr. Khokan is the elected Union Parishad Member of West Mokterpur village. The village is situated in the Northern side of Dalesshari river which is very much close to the proposed river terminal. BCAS met with him for an interview on 26th August, 2014 in port office. As a public representative he highlighted a lot of issues related to his village, the issues are as follows:

- We are living here in great miserable condition due to cement factories, the Shaha Cement factory, Crown Cement Factory, Holsim Cement Factory, Emirates Cement Factory, Bashudhara Cement Factory, is situated around 500meter from the Union Parishad Office. The generated dust from these industries are affecting the local community in terms of health.



- He was of the opinion that the river port may not pollute the environment except container vessel engine sound. He expected that the project sponsors will take steps to mitigate the sound that may be generated. Any kind of toxic pollution by the ship like oil spillage and chemicals in the river water, transport emissions, needs to be considered.
- As local member he appealed to the authority that they should provide jobs to the local unemployed youth based on their skill and should give business opportunities to the local people.
- As part of social development the local mosque near to the project site should be expanded by the project sponsors to overcome the current congestion especially during Friday prayers.
- There are no a hospital in our village. They will appreciate if the project sponsors establish one in the village.
- The access road needs to be carpeting. already picking out, our request to develop the road immediately even it will be needed for the port also, we hard that the access road from the main is going to carpeting but the another side road still in the weak position
- He requested to make provisions for a car parking outside of the port for better management of container carrying vehicles.
- Finally he gave the assurances that local government will give all help help for smooth operation of the project activities.

4. Key Informant Interview with the Deputy Chief Personnel manager of Bangladesh Inland Water Transport Corporation

Mr. Abul Kashem

Deputy Chief Personnel Manager

BIWTC, Narayangonj

Date: 25th August 2014

Cell No.: 01553723476

As part of a stakeholders consultation the BCAS Team member conducted an Interview with the High Official of BIWTC regarding the of Environmental and Social Impact issue due to establishment of a Container Port on the bank of the river Dalesshari, Munshigonj. BCAS team took interview of Mr. Abul Kashem on 25th August 2014 at his office at Narayangonj. BCAS team wanted to know the riverside impact and associated impact due to ships and container handling. He urged the following issue to be considered:

- He had some observation that the project sponsors should be careful about. The Mokterpur Bridge is very close to the port and hence care must be taken about the bridge span in terms of navigating the container vessels to ensure that the bridge is not damaged.
- Due to increased river traffic due to the project proper management of incoming and outgoing vessels in terms of loading and unloading is in implemented in order to avoid river traffic. This river way is vital for carrying goods and passengers therefore there should be no hindrance.
- During dry and winter season the river water become low and river becomes narrow. It must be ensured that minimum time is taken to load and unload the goods.
- Oily water from vessel washes may pollute the river water which will affect the terrestrial flora and fauna. This needs strict control to be imposed by the project sponsors.



- Vessel size should be used considering the Jetty front width, river draft, nearest bridge height and span to span difference, harboring capacity etc.
- The port authority have to be prepared for any kind of accidental occurrence which have preparedness like having a rescue team, good communication with the civil defense fire service and local administration.

5. Key Informant Interview with Ideal factory General Manager

Mr. Akhter Hossain Khan

General Manager, Ideal Textile Mills Limited, West Mokterpur, Munshigonj

Date: 24th August, 2014

Cell No.: 01720549356

BCAS team met with the general manager of Ideal Factory (Dyeing factory) of west Mokterpur on 24th August 2014 in the factory office. During the interview there were present Mr. Khokna, Mr. Kajal, Mr. Ruhul and Mr. Suruj. The discussing issues were the pollution due to the river port installation and operation beside the river bank of Dallesshari. Mr. Akhter Hossain gave his view to:

- The port will be a new addition for carrying the container and goods by the river at lower rate. Once the port is in operation they will use it to ship their export goods which will be cheaper by road transport that they are currently using.
- Export import business will be improved due to this port.
- Employment opportunity will be increased
- The only source of pollution from this port sound pollution. The project sponsors needs to take steps to abate the noise pollution.



- My factory is close to the port therefore, I will help SAPLRT authority to operate the port smoothly
- Adequate transport/vehicle parking place should be provided to avoid traffic congestion.
- Need to work in close cooperation to ensure that no water logging takes place due to the project by integrating the drainage systems in the area.
- Fire team should kept ready for avoiding any kind of disaster.

6. Key Informant Interview(KII) with the Fisheries Officer of Munshigonj

Mr. Rais Uddin Pathan

Assistant Director

Munshigonj Fisheries Office, Munshigonj

Cell No.: 01816 497367

Date: 23rd August, 2014

The Key Informant Interview (KII) was held in the Upazila Fisheries office of Munshiganj on 23rd August 2014 regarding the issues of Environmental and Social Impact due to installation of the Summit Alliance Port Limited River Terminal on the bank of Dhaleshwari River, West Muktarpur, and Munshiganj. The interview was conducted by BCAS survey team. The team wanted to know the impact of fisheries of Dhaleshwary River due to the port and ship movement. The officer expressed his view as follows:

- There is no fish sanctuary around the port site. Fish existence was found only three month during the rainy season. During the dry season the water quality become degraded and blackish which is not suitable for the fish. The quantity of dissolved oxygen in the water becomes low. The effluents from the textile mills dyeing water and chemical flow further aggravates the water quality and most unsuitable for aquatic fauna and marine species.
- Turbulence and wave from plying vessel movement can be a cause of fish resource sheltering in safer



waters. This is problem that is difficult to resolve as this is the only waterway fish will migrate upstream to Dhaka.

- Considering terrestrial flora and fauna, the authority can prepare habitat by tree plantation
- There are living some fisherman depending on the fishing in the Dhaleshwari River for 3-4 months; the authority can support them through livelihood restoration programmes.
- The authority can prohibited the discharge of oily water into the river during fish breeding period April- May.
- SAPLRT authority can invest in fish breeding in the river or nearby water bodies and employ the fishermen who are without a livelihood for nine months in a year.

7. Interview with an MBBS Doctor

BCAS team met with an MBBS doctor of the west Mukterpur village. He stated that the local people often complain lungs diseases. He identified the cement industry as the source of the excessive dust as the main reason.



8. Business community

Ikbal Hossain

Azmeri Enterprise

West Mokterpur, Munshigonj

LP Gas and Battery seller

In the FGD with this community they expressed optimism about the project in terms of business, this project may contribute to improve their business community productivity.

However, they expressed their concerns about the environmental issues like sound pollution

9. Women Group

FGD was held with the women group during the socio-economic survey. They gave opinion that during project implementation in the past in other areas their family members were not employed especially during the construction period



10. Farmers and day labourer living within 2km radius of the project location

FGD was held with the poor vulnerable group in the area during socio-economic survey. The people's concerns were recorded on the household level. One formal meeting took place to discuss all issues/impacts resulting from the project. During the surveys the environmental issues were communicated to the stakeholders. The major concern was the environmental aspect of the project and how it may affect their health



11. NGO's

This group was present during the formal consultation meeting. Meaningful community development for the people in the affected areas was demanded



12. Local Elite and School Teachers

This group generally expressed optimism for the potential of improved socio economic condition, eliminate the poverty of the locality. However, there were concerns about the environmental impact aspects of the project and that proper mitigation steps must be ensured.

13. Auto Rickshaw Driver

Md. Omar Ali

Driver, Shahid Nagar

Cell: 01713258371

We are driving our vehicle in this road from dawn to dusk. We earned and derive our 6 member family by this. If traffic congestion becomes severe than our income will be reduced and will have to divert our profession. We expect the authority will take measures



14. Fisherman group

Md. Eunus, Jashim, Rakib, Barek, Ali, Hasan, Billal, Liton

Sandespur, Panchaser, Munshiganj

According to the team leader Md. Eunus-we are fishing here only 3 to 4 month. Another time we work in the brickfield and some of us pulling rickshaw and van. There are 7-8 people in our team, every day we get two thousand to three thousand taka by fishing. September is the peak time for high income. Our concern is that if the ship comes during this time the fishing may be affected which will hamper our livelihood.



7.5 The Results of Consultation meeting and Concerns Raised

The results of the focus group discussions and stakeholder's consultation meeting with project affected people are detailed in Annex 13 of this Report. The information presented below discusses how concerns raised and recommendations made during the consultation process were addressed. The following queries were raised by the affected people during Public consultation and informal group meetings in and around the project site:

Stakeholders concern raised

- ✚ Whether there will be any environmental hazard due to River Terminal especially noise, water and air pollution?
- ✚ Whether the local people will be engaged in the project site during construction and operation works?
- ✚ Whether the people know about the installation of proposed River Port container terminal
- ✚ Whether they will get job, business or working facilities in this project site
- ✚ Whether the project create any traffic congestion
- ✚ Whether this project will be helpful for the locality and for the national revenue etc.

Observations from the Consultation Meetings

- ✚ The participants of the meetings have been found to be very supportive of the proposed project; they believe that the project would ultimately improve the overall socio-economic condition of the area.
- ✚ Participants expect that local businessmen will benefit from the construction and operation work of the proposed river terminal.
- ✚ Land and house owners expect that land prices and house rents in the area would increase due to the establishment of the river terminal.
- ✚ Participants expect that employment opportunities will be generated during both

construction and operational phases of the proposed project.

- ✚ According to the participants, air pollution (from cement industries and rice mills) and water pollution (from industrial effluent) are already major concerns in the area; noise pollution from project activities and incremental road and river traffic movement of water transport can be added concerns.

- ✚ Possible adverse impact of the project as identified by the participants include increased traffic congestion, possible increase in road accidents, increased ship movement in the river, and adverse impact on fishermen.

- ✚ Some participants raised the issue of possible interference of the proposed project in getting easy access to the river for different domestic purposes (e.g, washing, bathing).

Dr. MI Sharif of BCAS and Mr. Abdul Hakim of SARPLT addressed the issues raised by the stakeholders and explain how to mitigate these:

- ✚ Appropriate measures would be taken so that air, water and noise pollution are not aggravated by the proposed project activities.

- ✚ The project sponsors will be give job opportunities for local people depending on qualification and requirement.

- ✚ Project activities (e.g., movement of material and equipment) are carried out following a schedule such that it causes minimum impact on movement of people and vehicles.

- ✚ Initiatives has already been undertaken by the project sponsors for widening of the existing access road, providing road lights, and improving drainage condition surrounding the project site and social work like mosque improvement, institutions development are going on.



Photo 7.1-4 : Consultation meeting for sharing the information with different types of people in the SAPL site office. Dr. MI Sharif, Senior Fellow, BCAS delivered his power point presentation, Mr. Shawkat, SRO, BCAS facilitated the meeting and Mr. Hakim, COO, SAPLRT addressed the stakeholders quarries.

Chapter-8

GRIEVANCE REDRESS MECHANISM

8.1 Grievance Redress Mechanism

The objective of a grievance procedure is to ensure all comments and complaints from any project stakeholder, including local/regional authorities, residents of nearby residential areas, SAPLRT employees and other interested parties, are acknowledged and responded to within a reasonable timeframe.

SAPLRT will accept all comments and complaints associated with the project. The comments and complaints will be summarized and listed in a Complaints/Comments Log Book. Any person or organization may send comments and/or complaints in person or via post, email or facsimile using the contact information.

All comments and complaints will be responded to either verbally or in writing, in accordance with preferred method of communication specified by the complaint in the Comments and Complaints Form. All grievances will be registered and acknowledged within 5 days and responded to within 20 working days. SAPLRT will keep a grievance log and report on grievance management, as part of half-yearly project progress reports, available at SAPLRT website **www- saplbd.com** and on request at the project office

8.2 Stakeholders Engagement Plan

SAPLRT stakeholder's engagement will take place in a variety of contexts, and using a range of vehicles. Against this background, engagement will include consultation, joint planning, capacity building, partnerships, community-based monitoring and reporting. **Table 8.1** presents the scope and duration of existing and planned stakeholder engagement initiatives.

Table 8.1: Stakeholder engagement plan

Engagement vehicle	Stakeholders Involved	Engagement Tools	Duration of Initiatives	Frequency of structured meeting/ consultation
Public liaison Committee	All stakeholders in the project impacted (direct and indirect) area	Interaction between Stakeholder Liaison Officer, SAPLRT and representatives of stakeholders.	Life time of the project	Half-yearly
Community Development Plan	Communities in the project impacted area	Stakeholder Liaison Officer, SAPLR	Life time of the project	Half-yearly
Community Health Safety Plan	Communities in the project impacted area	Stakeholder Liaison Officer, SAPLR	Life time of the project	Quarterly
Corporate Communication Programme	All stakeholders	Corporate Communication Manger, SAPLR	Life time of the project	Half-yearly
Grievance Management Mechanism	Directly/indirectly affected stakeholders	Stakeholder Liaison Officer and Corporate Communication Manager, SAPLR and representatives of stakeholders.	Life time of the project	Quarterly

8.3 Resources and Responsibilities

To ensure proper caring on grievances raised by stakeholders the resource and responsibilities to be allocated in two levels as are mentioned in the following sections:

8.3.1 Port Level Resource and Responsibilities

Management of SAPLRT will have dedicated persons to play the role of Stakeholder's Liaison Officer at port site. He will have the overall responsibility for handling the consultation and information disclosure process, including:

- Organization of consultation process,
- Communication with identified stakeholder groups
- Collecting and processing comments/complaints,
- Responding to any such comments and complaints, and
- Depending on the nature of a comment/complaint, some comments/complaints will be provided to the appropriate person in the company for a response.

8.3.2 Corporate Level Resource and Responsibilities

As a senior representative of SAPLRT will play the role as required at the corporate level in dealing with addressing stakeholder's consultation. He is expected to review the findings/observations forwarded to port level and who will be responsible for implementing the decisions.

Table 8.2: Contact detail of resource persons

Level	Name of the person and tentative title	Phone	e-mail
Corporate level	Mr. Yasser Rizvi Addl. Managing Director	01971539960 9130845-54	yasser.rizvi@sapl.com

8.4 Reporting

There is requirement of two tiers reporting as are discussed briefly in the following section.

8.4.1 Internal Reporting

Local reporting relevant to the stakeholder's engagement will be undertaken under the corporate Communication Programme. At a corporate level, stakeholder's engagement will be reported in Annual Reports and in other relevant corporate documentation.

Management reporting on the stakeholder's engagement will take place through the Stakeholder's Liaison Officer. The Corporate Communication Manager will receive a quarterly report on engagement activities.

8.4.2 External Reporting

External Reporting means the reporting requirement for external client including funding agency, government and other regulatory bodies and so on. SAPLR will provide stakeholders Engagement Report to them according to the requirement of them. Corporate Communication Manager is expected to manage the external reporting requirement also.

8.4.3 Sample Grievance Reporting Form

A grievance form is presented below in Table 8.3 and hard copies of both English and Bangla will be made available at the SAPLRT project office.

Table 8.3: Sample Grievance Reporting Form

Contact Details	Name:		
	Address:		
	Telephone Number/ Cell Phone Number:		
	Email:		
How would you prefer to be contacted (please tick box)	By Phone By Email		
Details of your Grievance (Please describe the problems, how it happened, when , where, and how many times, as relevant)			
What is your suggested resolution for the grievance?			
Signature:		Date:	

8.4.5 Disclosure

The draft EIA report will be loaded on the Company website www.sapl.com and a copy is kept at the port for public review. Once the final version is ready, it will replace the draft version on the website. The executive summary will be translated into Bangla and will be made available to the public.

Chapter 9

SOCIO ECONOMIC SURVEY

9.1 Socio-Demographic Characteristic of the Project Area

According to the household survey, the Table 9.1 shows that the average household size is 4.4 in all impact area (i.e. the average number of persons per household). Overall, the average household size in the Project area is lower than the national average household size which is 4.5 persons (BBS, 2011).

Table-9.1: Average Family Size and Sex Ratio of Household Members of Study Area

Study Area	Average Family Size (number)	Sex Ratio
High	4.5	134.2
Low	4.3	140.3
All	4.4	136.6

9.2 Age Distribution of the Population and Marital Status

Age distribution of the population in all impact zone obtained from survey data shows that 4.8% of the population is children (0-4 years), 20.2% are adolescents in the 5-14 years old group, 37.3% are 15-30 years of age, 19.8% are of age 31-45, 15.0% are of age 46-60 and the remaining 2.9% are above 60 years (Table-9.2 and Fig. 9.1). In the high impact zone, 17.6% population is aged between 46-60 years whereas it is 11.0% in the low impact zone.

Table-9.2: Age Distribution of Household Members

Age Group (Year)	Percentage		
	High	Low	All
Up to 4	3.7	6.4	4.8
5-14	19.5	21.4	20.2
15-30	37.5	37.0	37.3
31-45	18.0	22.5	19.8
46-60	17.6	11.0	15.0
Above 60	3.7	1.7	2.9
Total	100.0	100.0	100.0

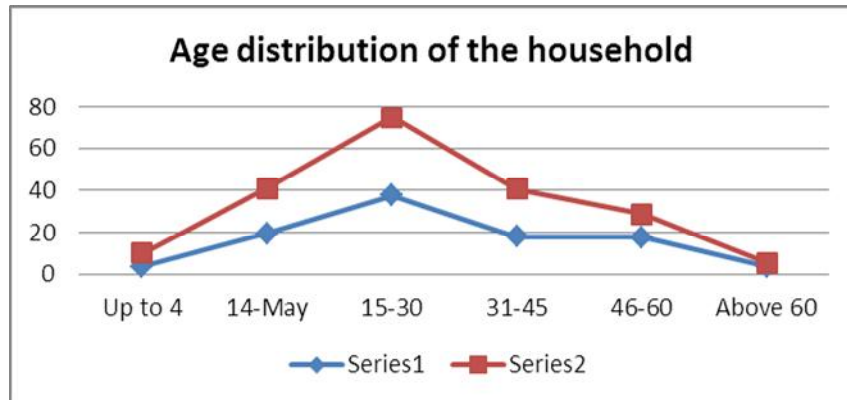


Fig.9.1: Age distribution of the household

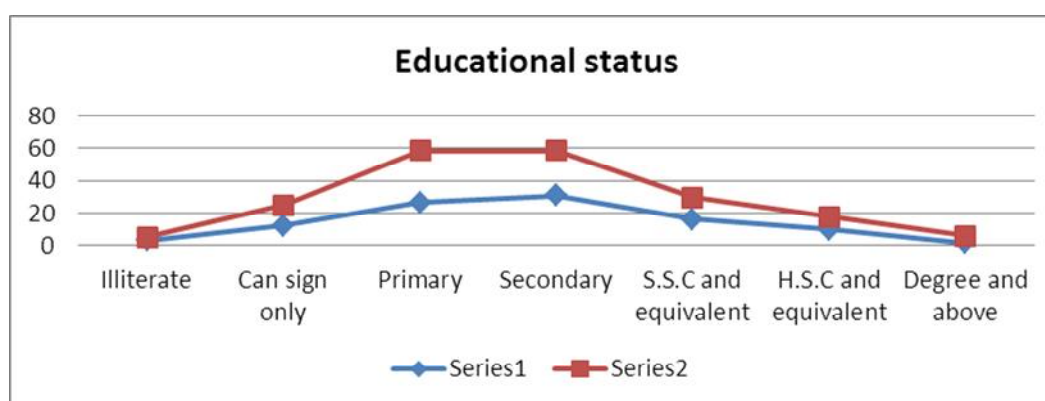
9.3 Educational Status

According to the survey, in all impact zones of the study area, 2.6% of the population is illiterate and 12.4% of the population can sign their name, although they can neither read nor write. The population in both the impact zones having primary level education (upto 5 years of schooling) and secondary level education (up to 10 years of schooling) are 28.6% and 29.6% respectively. Based on the data collected from the socio-economic survey, 15.0% of the population in both the impact zones has a Secondary School Certificate (S.S.C) and equivalent. It has been found that 9.1% of population has Higher Secondary Certificate (H.S.C) and equivalent and 2.7% of the population in all impact zones has Bachelors/equivalent degree and above (Table-9.3, Fig.9.2). The national literacy rate is estimated at 57.91%, according to BBS 2011.

The population having primary level education in the high impact zone is 26.6% whereas it is 31.9% in the low impact zone of the study area. 16.0% of the population in the high impact zone has Secondary School Certificate (S.S.C) and equivalent whereas it is 13.5% in the low impact zone of the study area.

Table-9.3: Educational Status of Household Members of Study Area

Educational Status	Percentage		
	High	Low	All
Illiterate	3.1	1.8	2.6
Can sign only	12.1	12.9	12.4
Primary	26.6	31.9	28.6
Secondary	30.8	27.6	29.6
S.S.C and equivalent	16.0	13.5	15.0
H.S.C and equivalent	9.8	8.0	9.1
Degree and above	1.6	4.3	2.7
Total	100.0	100.0	100.0

**Fig. 9.2:** Educational status

9.4 Occupation and Employment

The household heads in the surveyed are engaged in different types of primary occupation such as service, business, handicrafts, fishing, work in abroad etc. The survey reveals that the highest percentage (27.1%) of the workforce in all impact zones is engaged in household work. 24.2% of the population in all impact zones is engaged in different types of business in the surveyed area (Table-9.4, Fig. 9.3). In the all impact zones, 10.6% of the population is in service 16.2% of population is engaged in handicrafts and 19.6% of the populations are students. According to survey, only 0.5% of population works in abroad in the study area.

In the high impact zone, 12.2% of the population is engaged in service whereas it is 8.1% in the low impact zone of the study area. 23.2% of the population is engaged in business in the high impact zone compare to 25.6% are engaged in same occupation in the low impact zone. The survey reveals that 2.5% of the populations are wage laborer in the low impact area; however, 0.6% of the population in the low impact zone is engaged in fishing. Handicrafts constitute 14.6% and 18.8% in the high and low impact zones, respectively.

Table-9.4: Percentage Distribution of Primary Occupation of Household Members by Study Area

Primary Occupation	Percentage		
	High	Low	All
Service	12.2	8.1	10.6
Business	23.2	25.6	24.2
Wage labor	-	2.5	1.0
Household work	26.8	27.5	27.1
Handicrafts	14.6	18.8	16.2
Fishing	-	0.6	0.2
Student	21.7	16.3	19.6
Work in abroad	0.4	0.6	0.5
Others	1.1	-	0.6
Total	100.0	100.0	100.0

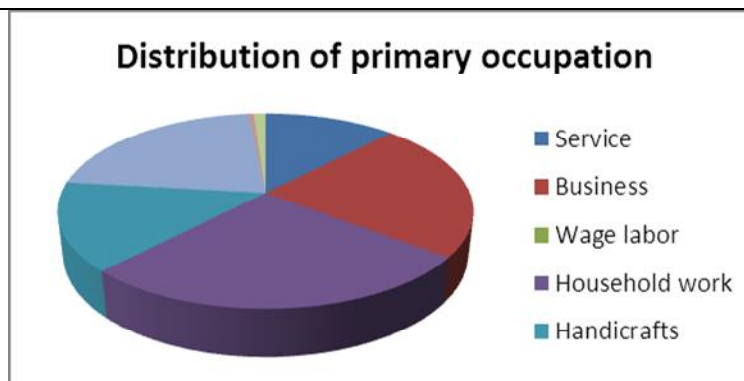


Fig. 9.3: Distribution of primary education

9.5 Percentage Distribution of Household Heads by Main Occupation

The household heads in the surveyed are engaged in different types of primary occupation such as service and business etc. The survey reveals that, in all impact zones, the highest percentage (76.0%) of the workforce is engaged in Business followed by different types of services (15.0%); only 3.0% household heads are wage laborer and 5.0% of the household heads is engaged in household work (Table-9.5 and Fig 9.4).

In the high impact zone, 78.3% of the household heads is engaged in business compare to 72.5% in the low impact zone. Service constitutes 16.7% and 12.5% in the high and low impact zones of the study area. Only 7.5% of the household heads are wage laborer in the low impact zone whereas 2.5% of the household heads is engaged in fishing in the low impact zone.

Table-9.5: Percentage Distribution of Household Heads by Main Occupation

Main Occupation	Study Area		
	High	Low	All
Service	10 (16.7)	5 (12.5)	15 (15.0)
Business	47 (78.3)	29 (72.5)	76 (76.0)
Wage labor	0	3 (7.5)	3 (3.0)
Household work	3 (5.0)	2 (5.0)	5 (5.0)
Fishing	0	1 (2.5)	1(1.0)
Total	60 (100.0)	40 (100.0)	100 (100.0)

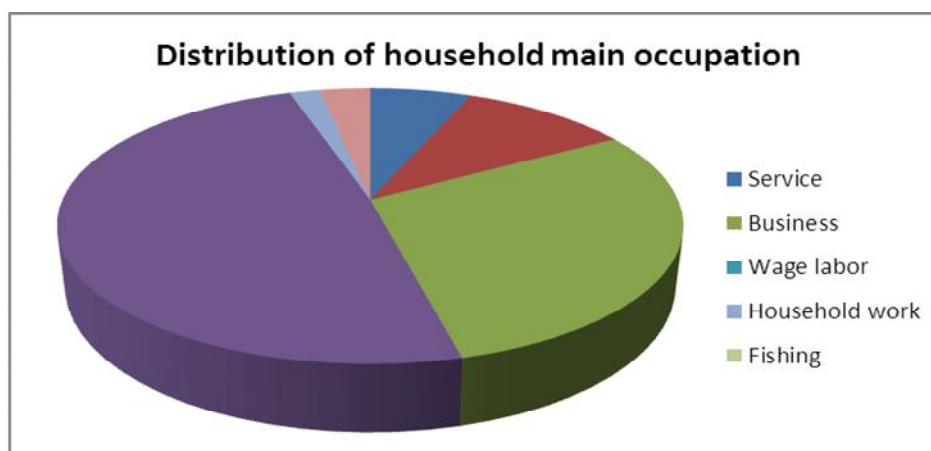


Fig. 9.4: Distribution of Household as a main occupation

9.6 Household Income, Expenditure and Distribution

According to the survey, average annual income per household in all impact zone is Taka 326,910 in the study area. However, the average annual expenditure per household in all impact zone is Taka 126,875 in the study area. Average annual income per household in the high impact zone is Taka 341,167 whereas it is Taka 305,525 in the low impact zone. Average annual expenditure per household in the high impact zone is Taka 132,117 compare to Taka 119,011 in the low impact zone of the study area (Table-9.6).

Table-9.6: Average Annual Income and Expenditure Per Household by Study Area

Study Area	Average Annual Income Per Household (Tk.)	Average Annual Expenditure Per Household (Tk.)
High	341,167	132,117
Low	305,525	119,011
All	326,910 (US\$ 4086.37)	126,875 (US\$ 1585.93)

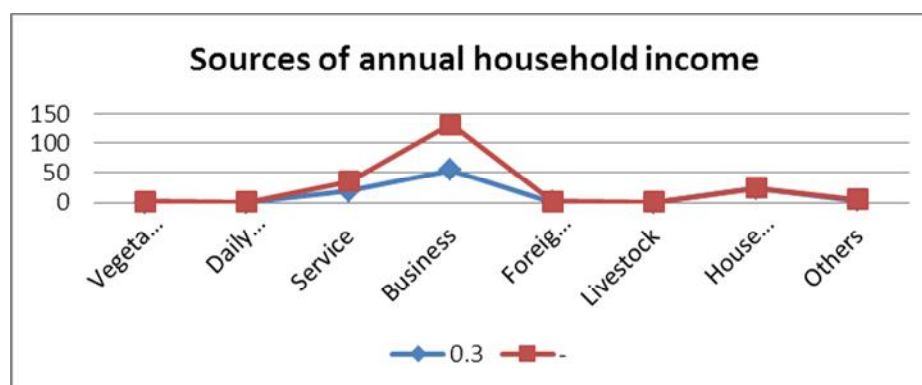
vii) Sources of Household Income

According to the survey, service is one of the major sources of livelihood accounting for 17.3% of household income in the study area, preceded by the largest income source – business - that contributes 62.7% to household income. The survey also reveals that, 15.1% of the households' income source is house rent (Table-13).

In the high impact zone, 54.6% of household income is business compare to 76.4% in the low impact zone. 18.7% of household income in the high impact zone is service whereas it is 16.1% in the low impact zone. In the high impact zone, 23.5% of household income is house rent in the study area (Table-9.7 and Fig.9.5).

Table-9.7: Percentage of Annual Income of Households from Different Sources

Source	Percentage		
	High	Low	All
Rice/Wheat production	0.3	-	0.2
Vegetables	-	1.6	0.6
Daily wages	-	1.1	0.4
Service	18.7	16.1	17.3
Business	54.6	76.4	62.7
Foreign remittance	0.6	1.3	0.9
Livestock	-	0.3	0.1
House rent	23.5	1.0	15.1
Others	2.3	2.2	2.3
Total	100.0	100.0	100.0

**Fig. 9.5: Source of annual household income**

9.7 Economic Status

The analysis of the households' economic situation has been focused on accessibility and affordability of food, clothing, educational facilities, medical facilities, transport facilities etc. With respect to availability of food, it is considered "satisfactory" by 48.4% of the households under the survey. Food availability is considered "good" by 51.6% of the households in the study area. The situation with respect to clothing is considered "satisfactory" by 48.5% of the respondents and considered "good" by 51.5% of the

respondents in the study area. As for housing /accommodation facilities, they are found “satisfactory” by 41.8% of the respondents, 51.1% of the respondents found them “good” and 7.1% of the respondents found them “unsatisfactory”. Educational facilities are considered “good” and “satisfactory” by 43.3% and 52.3% of the respondents, respectively. Medical facilities are generally considered “satisfactory” by 52.5% of the respondents in the study area whereas 38.4% of the respondents found them “unsatisfactory”. However, transportation facilities were scored as “satisfactory” by 48.5% of the respondents, while only 8.1% considered them as “unsatisfactory”. Entertainment facilities are considered “satisfactory” by 51.6% of the respondents whereas 34.0% of the respondents found them “unsatisfactory” in the study area (Table-9.8 and Fig 9.6).

Table-9.8: Economic Status of Households

Sector	Percentage			
	Good	Satisfactory	Unsatisfactory	Total
Food availability	51.6	48.4	-	100.0
Clothing	51.5	48.5	-	100.0
Accommodation/houses	51.1	41.8	7.1	100.0
Educational facilities	43.3	52.3	4.4	100.0
Medical facilities	9.1	52.5	38.4	100.0
Transport facilities	43.4	48.5	8.1	100.0
Entertainment	14.4	51.6	34.0	100.0

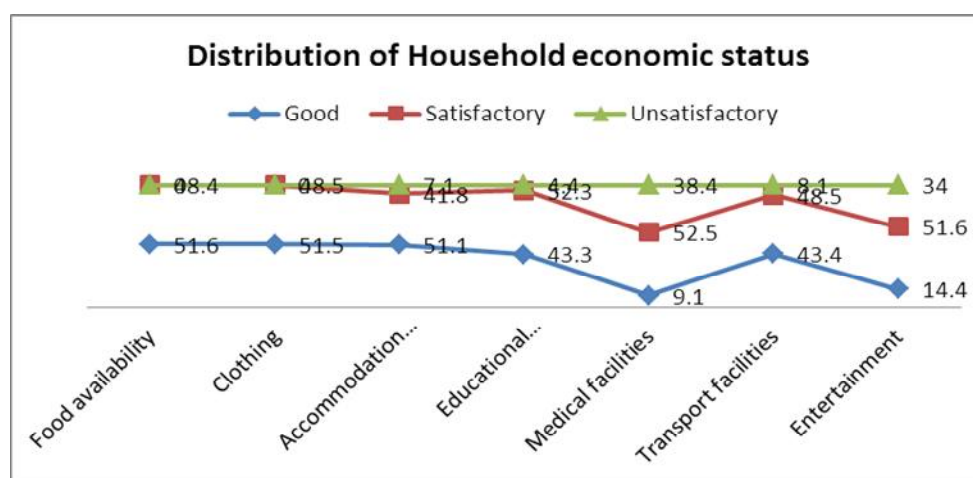


Fig. 9.6: Distribution of household economic status

9.8 Involvement with NGOs/CBOs

About 93.0% households in the study area are not involved with non-governmental and community-based organizations (NGOs/CBOs) whereas 7.0% family member has involvement in NGOs/CBOs (Table-9.9).

In the high impact zone, 95.0% of households in the study area are not involved with non-governmental and community-based organizations (NGOs/CBOs) compare to 5.0% involvement of the family member. In the low impact zone, 90.0% of households in the study area are not involved with NGOs/CBOs compare to 10.0% involvement of the family member.

Table-9.9: Percentage Distribution of Households Surveyed Having Family Member Involvement in NGOs/CBO

Study Area	Yes	No	Total
High	3 (5.0)	57 (95.0)	60 (100.0)
Low	4 (10.0)	36 (90.0)	40 (100.0)
All	7 (7.0)	93 (93.0)	100 (100.0)

Note: Figures within parentheses represent percentages

9.9 Housing Structures

Housing structures in the project impact area are of different types in terms of construction materials used. Most of the housings (57.3%) are brick floor with tin wall and roof in the study area. Housings with tin roof, tin wall and earthen floor constitute 25.0% of all HHs in the study area (Table-18). 11.3% of the households are buildings, 2.4% of the households are thatched and 4.0% of the households are made of earthen floor, thatch wall and tin roof in all impact zones of the project area. According to BBS 2011, at the national level the highest 38.46% of the household heads lived in house made of CI sheet/wood in the walls, 16.72% of the households were found living with wall made of mud/brick/wood whereas, same material was found in the roof of 1.52% households, fence/straw/bamboo was observed in the wall of 19.29% households and 3.09% roofs of the households.

In the high impact zone, most of the housings (63.4%) are brick floor with tin wall and roof compare to 49.1% in the low impact zone. 30.2% of the households are with tin roof, tin wall and earthen floor in the low impact area whereas it is 21.1% for the similar housing structure in the high impact area (Table-9.10 and Fig 9.7).

Table-9.10: Percentage Distribution of Households Surveyed by Housing Structure

Housing Structure	Study Area		
	High	Low	All
Building	14.1	7.5	11.3
Brick floor+tin wall+tin roof	63.4	49.1	57.3
Earthen floor+tin wall+tin roof	21.1	30.2	25.0
Earthen floor+thatch wall+tin roof	-	9.4	4.0
Thatch	1.4	3.8	2.4
Total	100.0	100.0	100.0

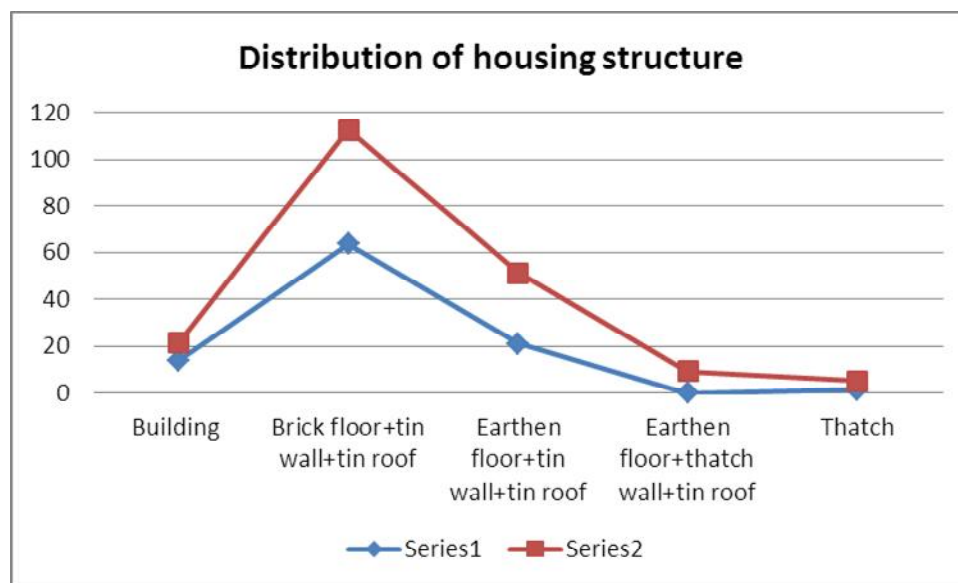


Fig. 9.7: Distribution of housing structure

9.10 Survey of Environmental Issues

Environmental problems that are perceived by the respondents in the study area includes water pollution, air pollution, industrial pollution, noise pollution over population, deforestation, diseases, poor sanitation, arsenic contamination of ground water, river bank erosion, sedimentation of water bodies etc.

According to the survey, the most pressing problem is air pollution in terms of the percentages of responses. The survey reveals that, air pollution have been mentioned by 37.8% followed by industrial pollution (3.0%), water pollution (2.0%), and Burning fuel, trees and agriculture residue (1.0%). Besides, health and sanitation problem and over population have also been mentioned by 97.0% and 91.9% respectively as low status of problem. The survey also reveals that 6.2% of the households mentioned noise pollution as moderately impacted problem in the study area (Table-9.11 and Fig 9.8).

Table-9.11: Percentage Distribution of Households Surveyed Showing the Status of Environmental Problem

	Status of Environmental Problem				
	No problem	Severe	Moderate	Low	Total
Water pollution	15.3	2.0	3.1	79.6	100.0
Air pollution	-	37.8	22.4	39.8	100.0
Industrial pollution	-	3.0	4.1	92.9	100.0
Burning fuel, trees and agriculture residue	53.2	1.0	-	45.8	100.0
Over population	1.0	-	7.1	91.9	100.0
Deforestation	100.0	-	-	-	100.0
River/canal bank erosion	92.8	-	-	7.2	100.0
Land erosion	99.0	-	-	1.0	100.0
Flash floods	97.9	-	-	2.1	100.0
Arsenic contamination	94.6	-	-	5.4	100.0
Sedimentation of water bodies	99.0	-	-	1.0	100.0
Health and sanitation problem	3.0	-	-	97.0	100.0
Disease	-	-	-	100.0	100.0
Noise pollution	46.9	-	6.2	46.9	00.0

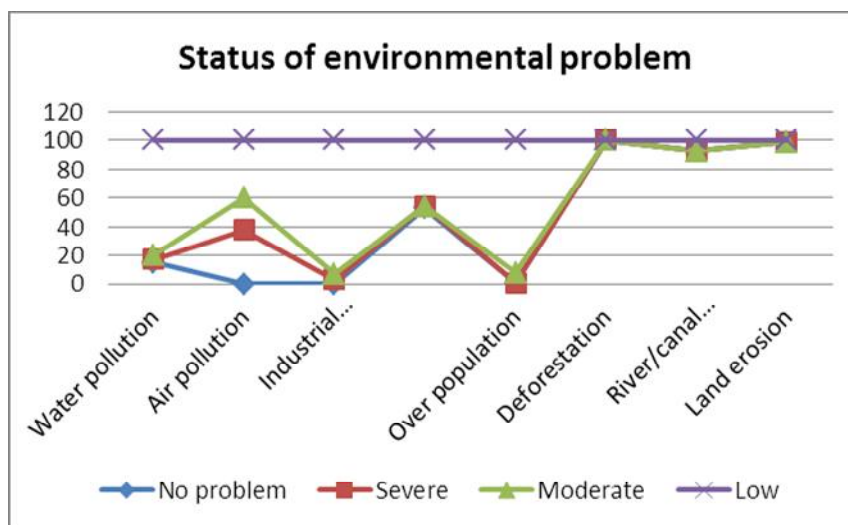


Fig. 9.8: Status of environmental problem

9.11 Sources of Water Pollution

Respondents attribute water pollution to different sources including human waste, water transport, animal waste etc. Industrial waste has been identified by 1.0% of the respondents as the most pressing source of water pollution in the study area; other sources identified as low by the respondents include human waste (54.5%), urban waste (95.8%) and pollution from water transport is 54.1% in all impact zones of the study area (Table-9.12 and Fig. 9.9).

Table-9.12: Percentage Distribution of Households Surveyed for Status of Water Pollution

Source	Status of Water Pollution Problem				
	No problem	Severe	Moderate	Low	Total
Industrial waste	7.1	-	1.0	91.9	100.0
Human waste	45.5	-	-	54.5	100.0
Water transport	45.9	-	-	54.1	100.0
Chemical feature/personnel	84.7	-	-	15.3	100.0
Siltation	100.0	-	-	-	100.0

Animal waste	100.0	-	-	-	100.0
Pollution from up stream	71.4	-	-	28.6	100.0
Urban waste	4.2	-	-	95.8	100.0

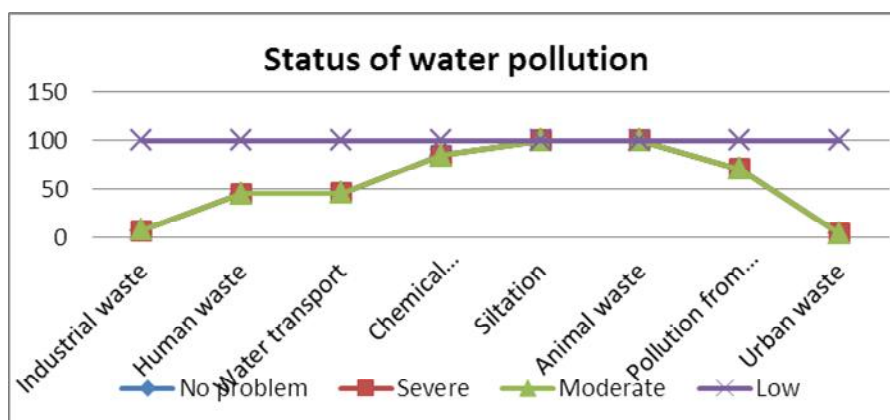


Fig. 9.9: Status of water pollution

9.12 Sources of Noise Pollution

According to the survey, respondents have attributed noise pollution to different types of vehicles that ply over the roads in all impact zones of the study area. 4.0% of the respondents attributed noise pollution to vehicles, construction work (7.1%) and pollution from big industries (3.0%) as moderate; whereas 84.9% and 26.3% mentioned commercial areas and small industries as low impacted sources of noise pollution respectively (Table-9.13 and Fig.9.10).

Table-9.13: Percentage Distribution of Households Surveyed for Status of Noise Pollution Problem

Source	Status of Noise Pollution Problem				
	No problem	Severe	Moderate	Low	Total
Vehicles	39.4	-	4.0	56.6	100.0
Big industries	23.2	-	3.0	73.8	100.0
Small industries	73.7	-	-	26.3	100.0
Construction work	28.3	-	7.1	64.6	100.0

Households sources Generator)	100.0	-	-	-	100.0
Power supply (irrigation engine)	100.0	-	-	-	100.0
Commercial areas	13.1	-	2.0	84.9	100.0

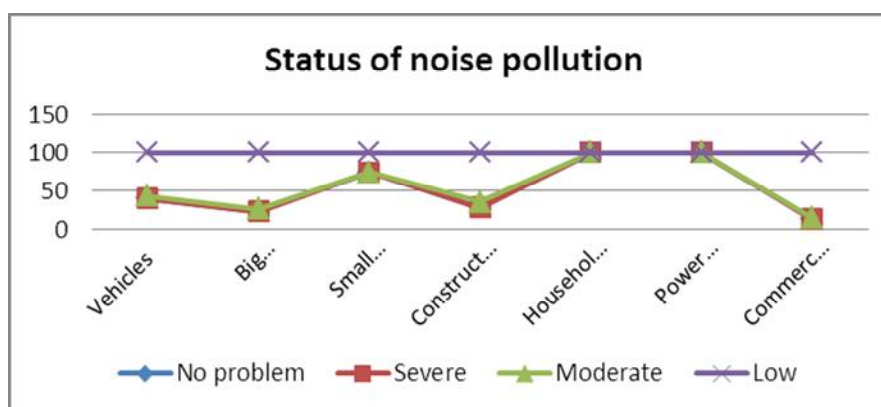


Fig. 9.10: Status of noise pollution

9.13 Sources of Air Pollution

According to the survey, 16.2% of the respondents mentioned big industries as the most pressing source of air pollution in the study area (Table-9.14 and Fig. 9.11). Various sources which contribute to air pollution, identified as low problem by the respondents, include vehicular emission (78.8%), open defecation (2.2%), small industries (26.3%), diesel engine (22.7%) and commercial areas (92.9%). Construction work (2.0%) has been identified as moderately impacted source of air pollution in all impact zones of the study area.

Table-9.14: Percentage Distribution of Households Surveyed for Status of Air Pollution Problem

Source	Status of Air Pollution Problem				
	No problem	Severe	Moderate	Low	Total
Brick field	100.0	-	-	-	100.0
Vehicles	21.2	-	-	78.8	100.0

Construction work	23.2	-	2.0	74.8	100.0
Small industries	73.7	-	-	26.3	100.0
Big industries	22.2	16.2	-	61.6	100.0
Diesel engine	77.3	-	-	22.7	100.0
Commercial areas	7.1	-	-	92.9	100.0
Gas field	97.9	-	-	2.1	100.0
Burning fuel, trees and agriculture residue	69.1	-	-	30.9	100.0
Open defecation	97.8	-	-	2.2	100.0

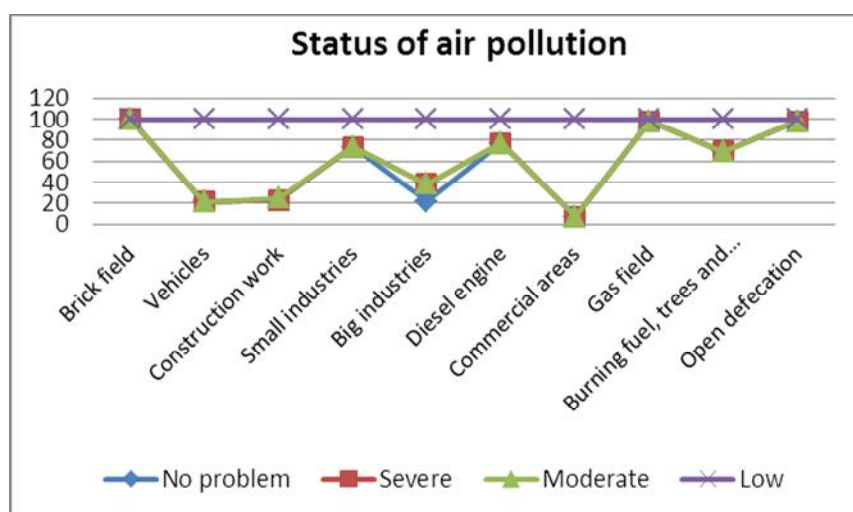


Fig. 9.11: Status of air pollution

9.14 Respondents' Awareness and Perception about the Proposed Project

i) Respondents' Awareness about the Project

The survey reveals that 97.0% respondents in the study area are generally aware and have heard of the project. The survey also reveals that, rests of the 3.0% of the respondents do not have knowledge about the proposed project. In the high impact zone,

98.3% of the respondents have knowledge about the proposed project compare to 95.0% in the low impact zone of the study area (Table-9.15).

Table-9.15: Percentage Distribution of Households having knowledge about the Proposed Project

Study Area	Yes	No	Total
High	59 (98.3)	1 (1.7)	60 (100.0)
Low	38 (95.0)	2 (5.0)	40 (100.0)
All	97 (97.0)	3 (3.0)	100 (100.0)

Note: Figures within parentheses represent percentages

9.15 Project Affected People

According to the survey, 100.0% households would not be affected due to the project activities. 60 households in the high impact zone and 40 households in the low impact zone mentioned that they would not be personally affected due to the project (Table-9.16).

Table-9.16: Percentage Distribution of Households Surveyed Personally Affected due to the Project

Study Area	Yes	No	Total
High	-	60 (100.0)	60 (100.0)
Low	-	40 (100.0)	40 (100.0)
All	-	100 (100.0)	100 (100.0)

Note: Figures within parentheses represent percentages

9.16 Expectation for Assistance from the Government/Project to Mitigate Losses

In general, the Project Affected People have expressed their willingness to get assistance/help from the government and the Project sponsors as part of mitigation of the possible losses due to the project implementation. However, 95.8% of the households surveyed is completely unaware about the makeup the loss due to the project. The survey reveals that 2.1% of the respondents would like the provision to open their shops for longer period to makeup the loss. 2.1% of the respondents would like to receive opportunities for business to mitigate loss due to the proposed project (Table-9.17).

Table-9.17: Percentage Distribution of Households for Make up the Loss

Make up the Loss	Study Area
Open shop long time daily	2.1
Through business	2.1
Don't know	95.8
Total	100.0

The respondents (79.0%) have expressed that they do not need any assistance from the government and the project. In the high impact zone, 86.7% of the respondents do not have any demand from the government or the project to makeup the loss compare to 67.5% in the low impact zone of the study area (Table-9.18)

Table-9.18: Percentage Distribution of Households Demanding Help from Government or Project to Make up the Loss

Study Area	Percentage			
	Yes	No	No response	Total
High	-	86.7	13.3	100.0
Low	-	67.5	32.5	100.0
All	-	79.0	21.0	100.0

9.17 Perceived Positive Impacts of the Project

Respondents also perceived that various benefits were expected to result from the implementation of the project. These benefits, as perceived by the respondents, include; creation of employment opportunity, access to roads, enhanced socio-economic conditions, and overall national development in the area.

According to the survey, creation of employment opportunities is perceived as a beneficial effect of the project for 98.0% of the respondents. The implementation of the project will lead to national development, according to the opinion of 87.0% of the respondents. Enhanced local socio-economic activities and access to road infrastructure in the local area have been mentioned as positive outcomes of the project by 36.0% and 94.0% of the

respondents respectively. Access to electricity (30.0%) and availability of irrigation water (10.0%) have also been mentioned by the respondents (Table-9.19).

In the high impact zone, creation of employment opportunities have been mentioned by 98.3% of the respondents whereas 97.5% of the respondents expect better access to infrastructure road in the low impact zone.

Table-9.19: Percentage Distribution of Households Surveyed Expecting Positive Impacts

Positive Impact	Study Area		
	High (n=60)	Low (n=40)	All (N=100)
More employment opportunity	98.3	97.5	98.0
Access to electricity	26.7	35.0	30.0
Access to infrastructure road	91.7	97.5	94.0
More local socio economic activities	33.3	40.0	36.0
Availability of irrigation water	15.0	2.5	10.0
National development	85.0	90.0	87.0

9.18 Morbidity in the Study Area

The survey has dealt with information on illnesses as experienced by the study population during the last twelve months. It has been found from the survey that the incidence of cold fever is very common among the study population. Cold fever responses came from more than 46.6% of all households during the last year preceding the survey. Other diseases include diarrhoea 6.7%, asthma 30.3%, jaundice 2.9%, hypertension 3.8%, diabetes 6.3%, stroke 0.5% and typhoid 1.4% (Table-9.20 and Fig.9.12).

In the high impact zone, 42.8% of the households are affected by cold fever whereas it is 55.3% for the same disease in the low impact zone. Asthma has been mentioned by 30.4% of the households in the high impact zone compare to 30.0% in the low impact zone of the study area.

Table-9.20: Percentage Distribution of Households Surveyed for Affected People by Different Diseases

Name of Disease	Study Area		
	High	Low	All
Cold fever	42.8	55.3	46.6
Diarrhea	8.0	4.3	6.7
Jaundice	2.9	2.9	2.9
Typhoid	1.4	1.4	1.4
Diabetes	9.4	-	6.3
Asthma	30.4	30.0	30.3
Hypertension	5.1	1.4	3.8
Stroke	-	1.4	0.5
Others	-	3.3	1.5
Total	100.0	100.0	100.0

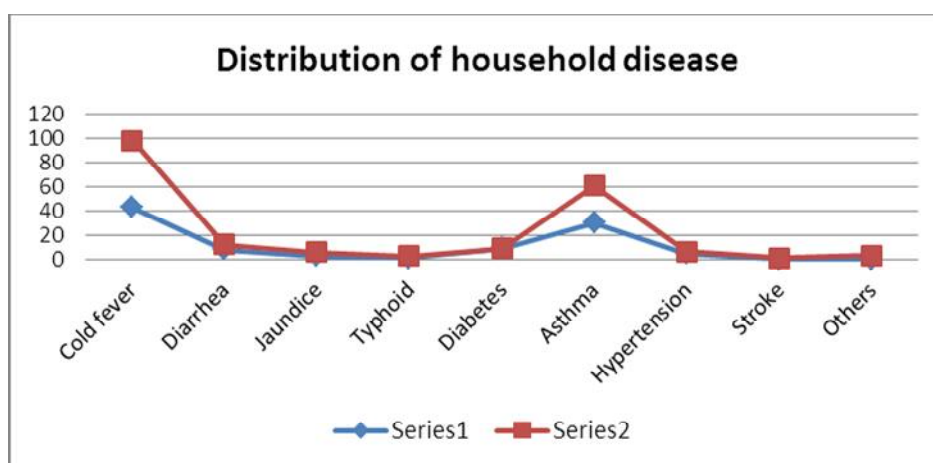


Fig. 9.12: Distribution of household disease

9.19 Average Number of People Affected by Different Diseases

According to the survey, on an average 1.5 adult male get cold fever whereas 1.2 adult female and 1.1 young boys get affected by the same disease. The survey reveals that on average 1.2 number of young girl get affected by asthma in the study area (Table-9.21 and Fig 9.13)

Table-9.21: Average Number of People Affected by Different Diseases

Name of Disease	Average Number of People Affected by Different Diseases			
	Male	Female	Boy	Girl
Cold fever	1.5	1.2	1.1	1.1
Diarrhea	1.0	1.0	1.0	-
Jaundice	1.0	1.0	1.0	1.0
Typhoid	-	1.0	1.0	1.0
Asthma	1.0	1.0	1.0	1.2
Hypertension	1.0	1.0	-	-
Diabetis	1.0	1.0	-	-
Others	1.0	1.0	1.0	-

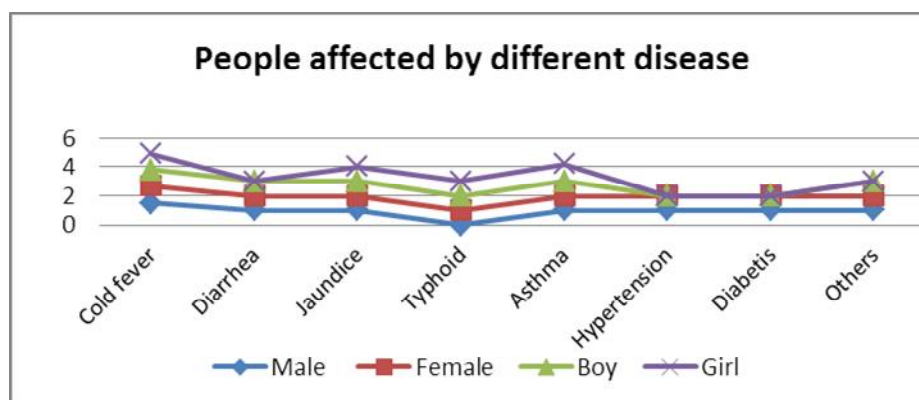


Fig. 9.13: People affected by different disease

9.20 Sources of Treatment

For the purpose of medical treatment, people in the study area depend on different sources including private practitioner/doctor, upazilla health complex, pharmacy, homeopath etc. The survey shows that medicine shops/pharmacy is the main source of treatment for 47.8% of the households in the study area followed by private practitioner doctor (26.9%). Other sources of medical treatment services are kabiraj (9.1%), homeopathy (3.8%) and Upazila health complex (12.4%) in the study area (Table-9.22 and Fig.9.14).

In the high impact zone, 45.6% of the households mentioned medicine shop as source of treatment compare to 52.5% in the low impact area. 28.8% of the households in the high impact zone mentioned private practitioner doctor as source of treatment whereas it is 23.0% in the low impact zone of the study area.

Table-9.22: Percentage Distribution of Households Surveyed by Source of Treatment

Source of Treatment	Study Area		
	High	Low	All
Kabiraj	5.6	16.4	9.1
Medicine shop	45.6	52.5	47.8
Homeopathy	2.4	6.5	3.8
Private practitioner doctor	28.8	23.0	26.9
Upazila health complex	17.6	1.6	12.4
Total	100.0	100.0	100.0

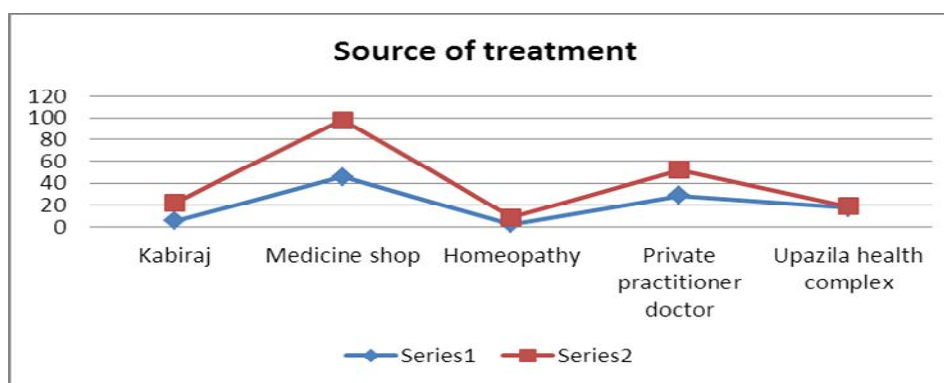


Fig. 9.14: Sources of treatment

Conclusion:

This survey report gives a more in-depth insight into the urban population. The population is large in the survey area, with the percentage of children being less in number as compared to the percentage being in the adolescent and old age group. The educational status in this area is much better than areas in the rural setting. There is a higher population of students who have achieved the higher secondary certificate. The primary occupation of the area comprises of business, services and overseas employment. Agricultural practices are minimal as compared to rural areas though they have better irrigation facilities.

The household income is higher in the urban area as compared to rural areas. Likewise, the household expenditure in this area is more. Majority of the expenditure includes food, clothing, education and healthcare. The economic status of the people is far better than those living in the rural areas. The housing structure is better; availability of food, clothing, medicine, transport facilities is also very good. They also have better access to amenities and infrastructure such as sanitation, market, bus stand, school, drinking water etc. The health condition of the study area is far better than the rural area population. They suffer from fewer diseases and they have better accessibility to medicine facilities. The households in the study area have more access to electricity and also to natural gas along with other sources and have good road connectivity.

The environmental issues in the project area are not that severe as compared to rural areas. A very small percentage of the population in the survey area has problems with noise pollution. Pollution from particulate matter is of major concern for the area. dust and of any form is not a problem for the population in the area. The respondents' in the study area are aware about the project and they feel that the project will provide them with more employment opportunity.

Chapter-10

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

10.1 Environmental Management Plan

Environmental Management Plan (EMP) of the Summit Alliance Port Limited River Terminal (SAPLRT) project is to record the environmental impacts resulting from the project activities and to ensure implementation of the “mitigation measures” identified earlier in order to reduce adverse impacts and enhance positive impacts from specific project activities. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operation phase of the Container Depot River Terminal.

The EMP should clearly mention:

- the measures to be taken during both construction and operation phases of the Project to eliminate or offset adverse environmental impacts or to reduce them to acceptable levels;
- the actions needed to implement these measures;
- a monitoring plan to assess the effectiveness of the mitigation measures employed.

Environmental management and monitoring activities of the proposed container depot Project could be divided into management and monitoring during:

- Construction phase
- Operation phase
- Decommissioning phase
-

10.1.1 Construction Phase

The environmental management plan should be carried out as an integrated part of the project planning and execution. It must not be seen merely as an activity limited to monitoring a regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as project implementation proceeds, dealing flexibly

with environmental impacts, both expected and unexpected. The environmental management during the construction phase should primarily be focused on addressing the possible negative impacts arising from:

- generation and disposal of sewage, solid waste and construction waste;
- increased traffic;
- generation of dust (particulate matter);
- generation of noise.

The environmental management should also focus on enhancing the possible beneficial impacts arising from employment of local workforce for construction works. Table 10.1 summarizes the potentially significant environmental impacts associated with the pre-operation phase, mitigation measures and institutional responsibility.

Table 10.1: Potential impacts and mitigation measures at Construction phase

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
Influx of workers	Generation of sewage and solid waste	▪ Construction of sanitary latrines and septic tank system ▪ Erecting “no litter” sign, provision of waste bins/cans, where appropriate ▪ Waste minimization, recycle and reuse (as required) ▪ Proper disposal of solid waste	SAPLRT Responsibility
	Possible spread of disease from workers	▪ Clean bill of health a condition for employment ▪ Regular medical monitoring of workers	
Transportation of equipment, materials and	Deterioration of air quality from increased vehicular movement, affecting people	▪ Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards and EHS guidelines (where applicable)	SAPLRT Responsibility

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
personnel; storage of materials	in the surrounding areas		
	Wind-blown dust from material (e.g. fine aggregate) storage areas	▪ Watering the access road ▪ Sprinkling and covering stock piles ▪ Covering top of trucks carrying materials to the site and carrying construction debris away from the site	
Site clearance	Topographic change by cutting existing trees, shrubs, herbs, and filling land	▪ Adopt such type design as is required minimum cutting of trees, shrubs, herbs, and low-land filling ▪ Use waste shrubs, herbs as organic fertilizers ▪ Adopt required measures to prevent waste shrubs, herbs as fuel to cook or for any localized burning purpose.	SAPLRT Responsibility
Noise from construction equipment operations and maintenance	Noise could exceed the allowable limit and result in hearing loss	▪ Avoiding, as much as possible, construction equipment producing excessive noise ▪ Avoiding prolonged exposure to noise by workers ▪ Creating a buffer zone by introducing green belt around the Project site ▪ Follow construction scheduling to avoid evening and nighttime disruption	SAPLRT Responsibility

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
Dust during construction and exhaust gases from construction machinery and vehicles (particulate matter, PM2.5, PM 10, NOx, SO2)	Increased SPM, PM 2.5, PM 10, NO _x , SO _x levels at construction sites, and surrounding areas	- Try to avoid using equipment such as stone crushers at site, which produces significant amount of particulate matter - Immediate use of construction spoils as filling materials - Immediate disposal/sale of excavated materials - Continuous watering of bare areas	SAPLRT Responsibility
Fires, explosion and other accidents	Risk of human health and property damage	- Use of personal protective equipments during construction and maintenance. Prepare and implement safety and emergency manual. - Regular inspection of lines for faults prone to accidents. - Provision of fire protection equipments. - Provision of Lightening arrestors	SAPLRT responsibility with Environmental and Social Monitoring Unit (ESMU) oversight

10.1.2 Operation Phase

SAPLRT is fully responsible for overall environmental management during operation phase of the Project. In this regard it is expected that SAPLRT will establish Environmental and Social Monitoring Unit (ESMU) for ensuring effective environmental and social compliances.

The environmental management during the operation phase should primarily be focused on addressing the following issues:

- emission from the vessels and crane
- generation of noise from the equipment
- waste generation at the

Table 10.2 summarizes the potentially significant environmental impacts during operation phase, the measures needed to eliminate or offset adverse impacts and institutional responsibility.

Table 10.2: Potential impacts and mitigation measures at operation phase

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
Project site, Access Road & Jetty	Road and River Traffic and Transportation	• Prepare a traffic and transportation plan for the construction phase, which includes (but not limited to): • avoid the transportation of materials or machinery during peak traffic periods; • stick to agreed traffic routes, avoiding narrow roads and villages; • enforce local road and river traffic rules; • implementation of a safety program (signage, speed restrictions, lights on trucks, truck load restrictions etc.) within the construction area; • provide training on safe driving; • prevent unauthorised access (i.e. public access) to the construction site; • load trucks in accordance with legal requirements and cover transported materials to prevent them falling off during transit; and • maintain and/or repair any private and public highways that have been damaged by vehicles from the construction site. • Resolve potential river traffic navigation problems	SAPLRT authority

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
		and construction of a jetty along the river bank. No significant increase in river traffic volume is anticipated. • A grievance mechanism established as part of a stakeholder engagement plan.	
Air emission generator	Emission from the container yard construction	• Installation of stack emission monitoring equipment for major pollutants • Planting of indigenous trees around the Project site	Environmental and Social Monitoring Unit (ESMU)
	Generation of noise from generators and associated sub-stations, which could exceed 70 dB(A) at site boundary	• Locate facility 70–100 m from nearest receptor; • Use walls, fencing, and/or greenbelt to provide partial noise barrier • Provision of critical silencers or generators (if need arises) • Use of ear-muffs and ear-plugs by port personnel working in the generator and turbine facilities of the port	Environmental and Social Monitoring Unit (ESMU)
	Suspended particulate matter (SPM) and PM _{2.5} , PM ₁₀ generation from the engine, which can adversely affect health	▪ Good combustion control, required stack height should also be maintained properly	Environmental and Social Monitoring Unit (ESMU)
	NOx generation from the engine, which	▪ Good combustion to maintain the dispersion as per modeling.	Environmental and Social Monitoring Unit (ESMU)

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
	can negatively affect health		
	CO and VOC, which can negatively affect health	Good combustion to control CO, PM 2.5, PM 10, and VOCs;	Environmental and Social Monitoring Unit (ESMU)
	Electro-magnetic wave or electrical interference, which may result in occupational health risk.	- All equipments should be grounded earthing with mesh system. - to sub-station should be connected by HT cable. & substation site is away from the settlement. - No house is located in the immediate vicinity of the site.	Environmental and Social Monitoring Unit (ESMU)
Occupational Health and safety	Solid wastes	- Apply the waste hierarchy and reduce, reuse or recycle wastes wherever possible. - Segregate wastes by types and provide appropriate waste containers for the storage of all waste streams. - Provide a specific area for the storage of solid hazardous wastes (i.e. batteries, fluorescent lighting tubes, used oil filters, aerosol cans etc.). - Prohibit the burning of wastes. - Arrange a waste removal contract and schedule at least weekly waste collections to prevent the build-up of waste materials. - Audit waste contractors to ensure appropriate disposal methods are applied according to the waste stream.	SAPL authority
	Hazardous Materials Management	Refueling, washing and maintenance of port site and vehicles will be prohibited in the vicinity of water bodies.	SAPL authority

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
		- Spill kits will be available to contain any accidental release of hazardous materials. - All hazardous materials will be provided with secondary containment.	
	Risk of human health and property damage	- All necessary safety equipment should be ready at the port. - Regular training on safety needs to be provided.	Environmental and Social Monitoring Unit (ESMU)
	Human and Sanitary Wastes	- Provision of an appropriate number of toilets and hand-washing points. - Provision of on-site treatment of sanitary wastes. - Training on sanitation practices.	SAPL authority
	Labour conditions	Bangladesh has ratified key International Labour Organisation (ILO) conventions, to ensure the work conditions are reasonable and safe, and employees are free from any form of discrimination.	SAPL authority
	Emergency Response (i.e. Fire, Earthquake, Flood etc.)	Appoint a suitably qualified Emergency Coordinator(s). Develop an Emergency Response Plan (ERP), Covering all foreseeable emergencies, for approval by SAPL authority The ERP will include: - what should be done and who should do it; - what equipment is required and where this will be located; and - staff training requirements and inductions for new workers and site visitors. In addition, the ERP will include: - a method for communication of the ERP to all workers and people arriving on-site; - an emergency contacts document which is	SAPL authority

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
		maintained up to date; • a review of local emergency services capability and resources. Where they cannot respond to a foreseeable emergency, ensure suitable resources are available at the site and trained/equipped to respond; and • liaison with local emergency services to ensure they are familiar with the site layout and potentially hazardous locations.	
Fires, explosion and other accidents	Risk of human health and property damage	▪ Use of personal protective equipments during operation and maintenance. ▪ Prepare and implement safety and emergency manual. ▪ Regular inspection of lines for faults prone to accidents. ▪ Provision of fire protection equipments. ▪ Provision of Lightning arrestors	ESMU
Domestic wastewater and sewage	BOD, fecal coliform contamination in groundwater and surface water	▪ Need to provide septic tank with soak pit for treatment of sewage.	SAPL authority to build to required infrastructure with proper specification
Wastes oil from Project (scrap metal, waste, lube oils, spill oil etc)	Potential soil and groundwater contamination	▪ Secure on-site storage, waste sell to the DOE authorized vendor for discharge in a safe place.	SAPL has primary responsibility. Disposal / treatment vendors have secondary responsibility
Public		Conduct proactive public relations (PR) exercises	SAPL authority

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
Relations & Stakeholder Engagement		consisting of news/information dissemination to increase understanding of the project. The PR will be carried out using local media, leaflets and meetings/seminars on the progress of the project and environmental and social enhancement measures associated with the project. A Public Relations Plan will be prepared by SAPL authority in order to: • establish clear stakeholder engagement channels. People in the neighbouring villages should have clear lines of communication to SAPL; • communicate how environmental mitigation measures will be implemented throughout the project; • receive, investigate and address any complaints and/or concerns from all stakeholders.	

10.1.3 Decommissioning Phase

SAPL is fully responsible for overall environmental management during post-operation phase or decommissioning phase of the Project. In this regard it is expected that SAPL will establish Environmental and Social Monitoring Unit (ESMU) for ensuring effective environmental and social compliances.

Table 10.3 summarizes the potentially significant environmental impacts during decommissioning phase, the measures needed to eliminate or offset adverse impacts and institutional responsibility.

Table 10.3: Potential impacts and mitigation measures at decommissioning phase

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
The demolition works will lead to significant deterioration of the acoustic environment.	Noise and Vibration	Demolition work is to be carried out only at day time	Environmental and Social Monitoring Unit (ESMU)
Demolition of the proposed Port Terminal will result in generation of solid waste and leakage of spent lube oil and other raw materials.	Solid waste generation and leakage of spent lube oil and other raw materials.	The waste is to be collected and disposed properly.	ESMU
Some dust will be generated during demolition works of the proposed .	Dust generation	Continuous watering of bare areas	ESMU
During decommissioning movement of trucks carrying heavy demolition equipment and demolished materials will cause adverse impacts.	Risk of human health and property damage	Vehicle is to be operated with proper care	ESMU

Chapter-11

INSTITUTIONAL ARRANGEMENT AND ENVIRONMENTAL MONITORING

11.1 Institutional Requirements

For ensuring the construction and operation of the River Port Container Depot according to the required compliance, there should be designated entity/institution or unit. The institution will be fully responsible to maintain the safeguard compliances. SAPLRT authority has realized the importance of establishing a separate entity for environmental monitoring and management. So, to maintain the environmental and social compliances, SAPLRT authority has planned to establish an individual compliance unit operating under the guidance of Head of Operation. They are planning to name the unit as Environmental and Social Monitoring Unit (ESMU). The detail of the ESMU has been discussed in the following sections.

11.1.1 Environmental and Social Monitoring Unit

SAPLRT authority is in principal obligated to relevant national and international environmental and social compliances and standards. It has informed that it will try to maintain all relevant compliances during construction and operational phases. In doing so, it has planned to form ESMU as is mentioned in the earlier section. The duties of the ESMU will include to:

- ensure environmental and social safeguard compliances;
- coordinate environmental monitoring process;
- act as liaison with the public, local organizations and government;
- ensure and supervise record keeping, data storage for follow-up actions;
- monitor hazardous materials storage and handling;
- promote environmental awareness and safety measures; and

- prepare environmental management and periodic monitoring reports as required by IDCOL, DOE and ADB .

11.1.2 Composition of Environmental and Social Monitoring Unit

The ESMU will be based on three tiers operational mechanism. It will be led by Head of Operation of the Container Terminal River Port. Head of Operation will serve as General Manager (Planning, Administration and Safeguard Compliance). Under his guidance there will be one Compliance Manager, who will be supported by two Compliance Officers. One Compliance Officer will be responsible for all sorts of environmental aspects and standards and another one will be assigned to maintain social and occupational health and safety aspects and standards.

Consulting services will be mobilized as necessary to assist in initial operations, to ensure that the ESMU will be self-sufficient for EMP implementation, submission of progress reports, and preparation of environmental assessment for subsequent construction works. Additional third-party services may be employed by the SAPL as necessary. Qualified and experienced construction contractor will be responsible for implementation of mitigation measures during the construction phase.

To look after the EHS aspects during the Construction Phase, SAPLRT authority has already deployed an EHS Officer having Master Degree in Environmental Engineering. Based on the performance, he will be extended for the Operation Phase or a new EHS officer will be recruited. The major responsibilities of the EHS Officer are as follows:

- Monitor the environmental, health, safety, fire protection and emergency response matters;
- Ensure the compliance of the Department of Environment;
- Ensure the compliance of other external stakeholders;
- Monitor the implementation of the EMP;
- Develop standard operational procedure (SOP) for EHS aspects;
- Conduct safety inspections; provide safety training to promote a safe working environment for the employees.

11.1.3 Environmental Training

Training is an integral part of a preventive strategy. Environmental and disaster management training will be required to ensure proper implementation of effective environmental management and monitoring plan; and disaster management plan. However, training could be organized by ESMU involving relevant staff. As a trainer, competent Consultant can be outsourced. Important training under the spectrum of ESMU needs to include:

- Training on fire fighting;
- Training on environmental regulations and standards;
- Staff training on environmental monitoring;
- Training on environmental health and safety measure.

11.2 Environmental Monitoring

Environmental monitoring is an essential component of environmental management plan, as it provides the basic scenario of the impact of the project on baseline condition. The prime objectives of environmental monitoring are:

- assess the effectiveness of proposed mitigation measures by comparing monitoring result with baseline data/environmental standards;
- identify the extent of environmental impact;
- determine project compliance with regulatory requirements;
- adopt remedial action and further mitigation measures if found to be necessary.

During the Construction Phase, the construction contractor will ensure that activities like land leveling, clearing work, access road construction, putting proper traffic signals etc. have been accomplished properly to minimize the level of impact. This in turn has to be monitored by the Compliance Manager and Compliance Officers of ESMU of the Container Depot, in operation phase. Preventive maintenance should be carried out to

identify and resolve problems related to cooling oil, gaskets, circuit breakers, vibration measurements, and other monitoring activities at regular intervals. Monitoring of oil water separation and sanitary waste treatment should be done periodically to avoid water pollution. Other environmental good practices include noise abatement, maintaining hygienic conditions, maintenance of fire and safety equipment etc. and clearing of grass should be done periodically and medium height teleportation around the substation wall should be done at the port areas.

SAPLRT authority should develop a working relationship with the DOE by undertaking a joint monitoring program to monitor ambient air quality and also to assess whether there exists any significant noise problem; or they may exchange data and information or submit periodic report on self monitoring to the DOE or as the situation may require.

The proposed monitoring program should be in compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the port does not create adverse environmental changes in the area and provide a database of operations and maintenance, which can be utilized if unwarranted complaints are made.

11.2.1 Environmental Monitoring Parameters

Environmental monitoring requires set of parameters that could be conveniently measured, assessed and evaluated periodically to observe the trends of change in base line environmental quality. A list of possible parameters to be tested, sample number and sampling frequency are given in **Table 11.1**.

Table 11.1: Monitoring parameters and frequency of monitoring during trial run

Key parameters to be monitored: (1) Ambient Air Quality			
location	frequency	parameter	submission
At Project site, residential/institutional/commercial areas within 500m outside from project boundary (4 locations)	Once during trial run	SOx, NOx and CO	Submit to Dhaka Divisional Office of DOE.
Key parameters to be monitored: (2) Noise			
location	frequency	parameter	submission
At four corners of Project boundary, residential/institutional /commercial areas within 100m and 300m outside from port boundary	Hourly basis for 24 hours during trial run	Limits in dBA	Submit to Dhaka Divisional Office of DOE.

Table 11.2: Monitoring parameters and frequency of monitoring during operation phase

Key parameters to be monitored: (1) Ambient Air Quality			
location	frequency	parameter	submission
At Project site, residential /institutional /commercial areas within 500m outside from project boundary	Quarterly (routine) analysis	SPM, PM10, PM 2.5, SOx, NOx and CO	Report compilation and quarterly submission to Dhaka Divisional Office of DOE.
Key parameters to be monitored: (2a) Surface Water			
location	frequency	parameter	submission
Project site at West Mukterpur, Munshigonj	Bi-annual basis in each year (pre-monsoon and post-monsoon)	pH, Temperature, DO, BOD, COD, TDS, TSS, Oil and grease	Report compilation and yearly submission to Dhaka Divisional Office of DOE.

Key parameters to be monitored: (2b) Ground Water			
location	frequency	parameter	submission
Project site at West Mukterpur, Munshigonj	Bi-annual basis in every year (pre-monsoon and post-monsoon)	pH, Temperature, DO, BOD, COD, TDS, Oil and grease	Report compilation and yearly submission to Dhaka Divisional Office of DOE.
Key parameters to be monitored: (3) Noise			
location	frequency	parameter	submission
At four corners of Project boundary, residential/institutional /commercial areas within 100m and 300m outside from project boundary	Quarterly (routine) analysis (four times in each year)	Limits in dBA	Report compilation and quarterly submission to Dhaka Divisional Office of DOE.

11.3 Environmental Monitoring and Management Budget

Environmental monitoring is conducted to compare the change between baseline condition and after project scenario, by testing some environmental parameters of air, water and noise and in case of necessity soil is tested. ESMU is fully responsible for environmental monitoring as well as implementation of environmental management plan. As testing environmental parameters required sophisticated instruments, it is suggested that ESMU should outsource consulting firm for testing and analyzing environmental parameters. But it will have to be equipped with required instruments gradually by purchasing required instruments. However, a tentative environmental monitoring budget has been proposed in **Table 11.3**. Laboratory analysis fees considered as per monitoring fees format of DOE/private laboratories.

Table 11.3: An annual tentative budget for environmental monitoring (Operation Phase)

Activity	Units	Total Cost (Tk.)
Fire fighting and suppression equipments, training and annual fire safety drill	1 site	150,000
Cost of occupational health and safety equipment	1 site	125,000
Quarterly test of ambient air quality (SPM, SO _x , NO _x)		75,000
Half yearly test of surface water (pH, Temperature, DO, BOD, COD, TDS, Oil and grease)		75,000
Half yearly test of ground water (pH, Temperature, DO, BOD, COD, TDS, Oil and grease)		75,000
Quarterly noise monitoring		25,000
Environmental Training	lump sum	125,000
ESMU Staff's annual salary (3 persons)	lump sum	800,000
Sub Total in Tk.		14,50,000
Contingency (10 %)		145,000
Total in BDT		15,95,000
Note: (Considering USD 1 = Tk. 80.0)		USD 19937.5

11.4 Financial Arrangement for Environmental Monitoring and Management

SAPLRT authority will provide the full financial support to Environmental and Social Monitoring Units (ESMU). For ensuring smooth and uninterrupted functioning of ESMU, it is suggested that SAPLRT authority will allocate the required fund based on analysis of estimated budget proposed by ESMU early in the every financial year. So, ESMU can run its operation to ensure environmental monitoring as well as implementation of proposed environmental management plan as may cause due to the unavailability of fund.

11.5 Environmental Monitoring and Management Reporting

As a part of environmental and social compliances, SAPLRT authority will submit quarterly EHS compliance report of the Project to IDCOL. This report will contain the analysis of testing various environmental parameters during monitoring phase. It will also describe in detail about the status of implementation of environmental management plan. IDCOL will monitor the EHS compliance half-yearly. Based on the findings of half-yearly monitoring, IDCOL will submit annual EHS monitoring report to ADB. The schedule of reporting the monitoring arrangement has been presented in the following **Table 11.4**.

Table 11.4: Reporting schedule

Reporting entity	Frequency of Report	Entity to whom the report will be submitted
SAPL	Quarterly EHS Compliance Report	IDCOL
IDCOL	Annual ESDDR Report based on the findings of half-yearly monitoring of the River Terminal Container Port	ADB

Chapter 12

EMERGENCY RESPONSE AND DISASTER MANAGEMENT PLAN

12.1 Emergency Response

The initial response to an incident is a critical step in the overall emergency response. Like all other Industries and installations, River Terminal Container Depot facilities must have adequate measures against accidents or incidents to meet the emergency. The purpose of having an Emergency Response Plan (ERP) is to:

- ✚ Assist personnel in determining the appropriate response to emergencies.
- ✚ Provide personnel with established procedures and guidelines.
- ✚ Notify the appropriate Company Emergency Response Team personnel and regulatory/ Govt. agencies.
- ✚ Manage public and media relations.
- ✚ Notify the next-to-kin of accident victims.
- ✚ Promote inter-departmental Communications to ensure a “Companywide” Co-ordinated emergency response.
- ✚ Minimize the effects that disruptive events can have on company operations by reducing recovery times and costs.
- ✚ Respond to immediate requirements to safeguard the subtending environment and community.

Generally, the initial response is guided by three priorities Ranked in importance these priorities are:

1. People
2. Property
3. Environment

Emergency Response Procedures will identify who does what and when in the event of an emergency. Responsibility for who is in charge and their coordination of emergency actions shall be identified. Nature of Emergency & Hazardous Situations may be of any or all of the following categories:

I. Emergency

-  Fire,
-  Explosion,
-  Electric shock
-  Medical emergency

II. Natural Disasters

-  Storm/ typhoon/ tornados
-  Cloud burst lightning
-  Sudden Tidal Surge and Cyclone
-  Sudden Flooding
-  Earth Quake
-  Fire

III. External Factors

-  Food poisoning/water poisoning,
-  Sabotage, and
-  War.

12.1.1: Six Steps in Emergency Response

Step-1

- a) Determine the potential hazards associated with the incident, substance or circumstances and take appropriate action identify the type and qualities of dangerous goods involved and any known associated hazards.
- b) Determine potential hazards stemming from local conditions such as inclement weather water bodies etc. and ensure that the initial response team is aware of these conditions.

Step-2

Determine the source/cause of the event resulting to the emergency and prevent further losses.

Step-3

Conduct an assessment of the incident site for any further information on hazards or remedies.

Step-4

Initiate redress procedures.

Step-5

Report the incidence its nature cause impact applied redress procedures and any further assistance required etc. to the appropriate company, government and/or land owner.

Step-6

Take appropriate steps with respect to hazards to wildlife, other resources and addressing public and media concerns and issues, as applicable. Response priorities are to protect human lives, property and the environment.

12.1.2 Reporting Incidents and Accidents

All accidents and near-miss incidents shall be investigated to determine what caused the problem and what action is required to prevent a recurrence. Employees required to perform investigations shall be trained in accident investigation techniques. The incident/accident investigation should be a fact-finding exercise rather than faultfinding. The investigations will focus on collection of evidence to find out the “root cause” of the incident. The recommendations of the investigation report are implemented in phases.

12.1.3 Approaches to Emergency Response

For this project, emergency response systems should be in place to deal with dangerous goods uncontrolled releases of dust and gaseous emission, natural calamities fires burns and injuries. There are to be trained emergency response teams, specific contingency plans and incidence specific equipment packages in place to cope with these types of emergencies. In case of an emergency incident occur, immediate action must be taken to

mitigate the impacts.

In order to minimize the possibility of injury to the responders and others it is important that emergency responders follow a specific sequence of actions as stepped out in the preceding paragraphs

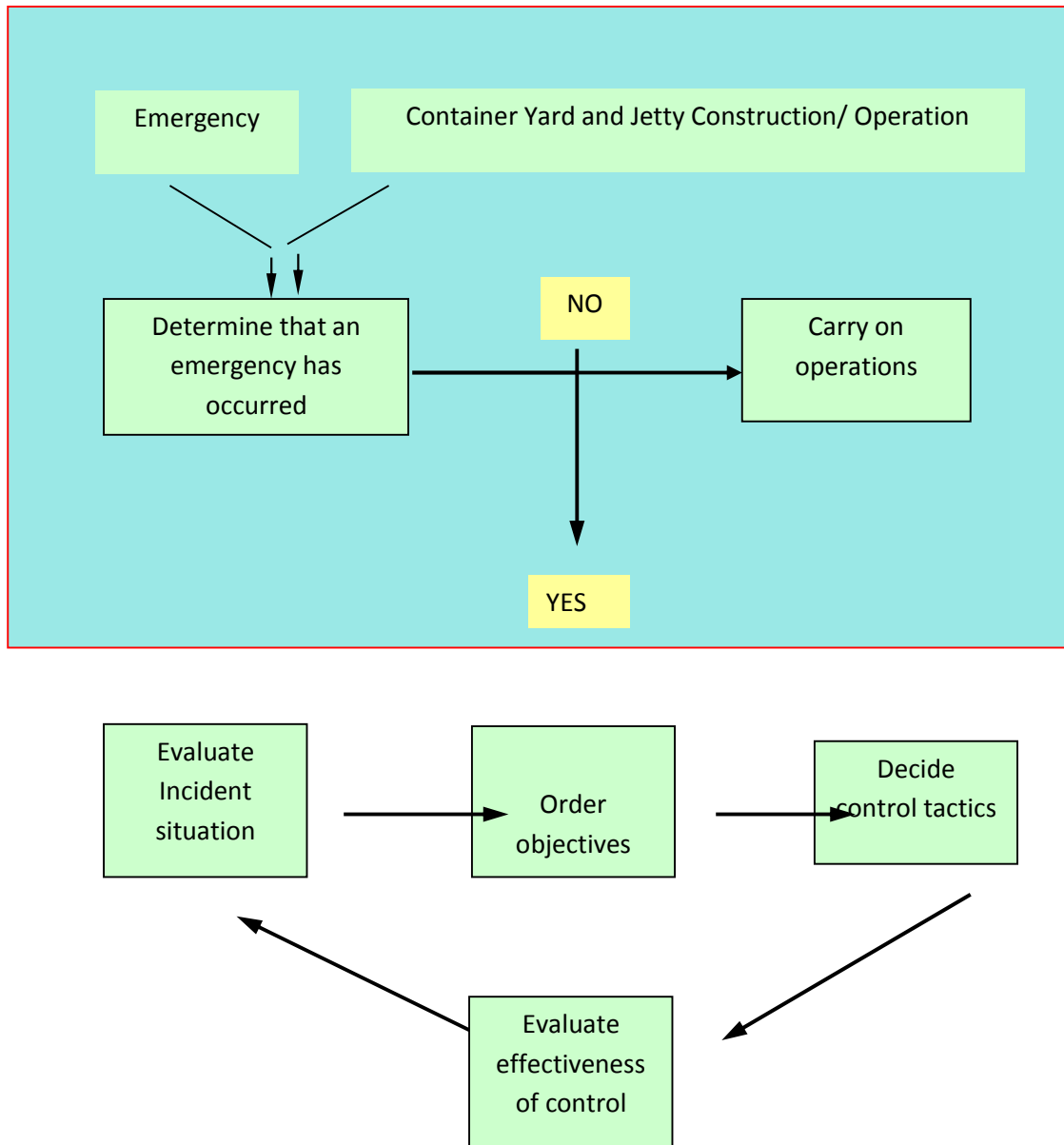


Figure-12.1: Illustrates an Example System Approach to Jetty and Container Yard Construction & Operations.

12.2 Disaster Management Plan

In normal operation of the project, when all environmental protection equipment works according to design specification, then there would be no environmental problems for the present project site.

Disaster (to certain degree) may occur if the environmental protection equipment fails to work at normal condition. This situation may arise for any of the following causes-

- ✚ When Terminal runs at abnormal situation e.g. if emission level increases than its normal level or if the engines give unwanted noise than normal level
- ✚ If liquid waste over flows and pollutes the surroundings

Therefore, appropriate management plan should have to be taken by the project proponent to prevent any unwanted disaster in the project. In this regard, there should be a provision to stop the production immediately during any process failure as discussed above.

The disaster management plan should consist of preventive measures including, among others, the following.

- ✚ Formulation and strict implementation of safety codes and measures;
- ✚ Periodic inspection of safety relief valves provided with pressure vessels and equipment;
- ✚ Preventive maintenance;
- ✚ Aware the workers about electric shock
- ✚ Declaring the factory a “no smoking zone”
- ✚ Mock drills by the fire fighting cells/ groups
- ✚ Provision and inspection of firefighting equipment and fire hydrant system in all the sections;
- ✚ Proper training of the employees about the importance of codes;

- ✚ Training the employees and the residents of the surrounding villages about the actions to be taken during an accident, disaster etc.

It is imperative to develop entire facility environment policy and display necessary documentation for ease in accessing information. Some of these documents include:

- ✚ Emergency contacts;
- ✚ Emergency response procedures for fires

The facilities operations and monitoring are carried out under the management and help from both the employees and relevant government lead agencies. In order to take care of any hazards the following control should be adopted:

- ✚ All safety precautions and provisions covering the general cleanliness of the entire facility down to, ventilation, lighting, sanitary, waste collection, smoke detector, heat detector, sand bucket, water bucket, fire blanket, first aid box provision, adequate fire extinguishers and site security by fencing.

12.3 Environment, Health and Safety (EHS)

Health and safety aspects of the entire facility should be given due attention. Protective devices as provided should continuously be used within the unit's operations to ensure the safety of the natural resources and boat owners is guaranteed.

The maintenance of Material Safety Data Sheets (MSDS) will be followed to ensure safety all section of the facility that chemicals are utilized.

An Environment, Health and Safety register is essential for monitoring of performance of the entire facility community in relation to the environment. The management will use this as a self-auditing tool. This register should include:

- ✚ Fire extinguisher servicing records
- ✚ EHS meeting schedules and training records

- ✚ Electrical installations
- ✚ Generator inspection and maintenance records
- ✚ Waste disposal records
- ✚ Inventory records (fuels, paints, cleaning agent
- ✚ Emergency response procedure.
- ✚ Record off all incidents, accidents, near miss etc.

12.4 Fire Hazard & Fire Evacuation Plan

Fire hazards such as large quantities of fuel, combustible/flammable liquids, electrical hazards and combustible dusts. Although fires are not a daily occurrence, they usually will cause severe property damage and business interruption. Sometimes the fire protection equipment systems have not received attention since they were installed. If these systems are needed, however, they are counted upon to perform reliably and protect vital port equipment from fire. Fire protection systems are a combination of mechanical and electrical components and, like power generation equipment, need regular attention.

In addition, some people in charge of fire protection do not have an adequate knowledge of necessary inspection and testing frequencies, or they use the minimum frequencies prescribed by their authority having jurisdiction. For example, some jurisdictions only require annual water flow alarm tests on sprinkler systems, a frequency which is considered inadequate by most fire protection professionals.

The information contained in this part is based on the current standards established by the National Fire Protection Association (NFPA); the most widely used in North America, and generally accepted guidelines. Most fire protection systems are designed and installed according to these standards. Unfortunately, information on inspection, testing and maintenance is not contained in a single standard but is contained within the various system-specific standards, making it cumbersome and difficult to obtain an overview of the tasks which need to be accomplished.

Other codes and standards such as UBC, UFC, BOCA, OSHA and MSHA also address fire protection, but their contents are usually based on NFPA documents and may not address testing/maintenance requirements. Members on the NFPA technical committees comprise a wide range of fire protection expertise and include representatives from manufacturers, testing laboratories, users, authorities having jurisdiction and insurance companies. Adherence to NFPA standards will satisfy most jurisdictions and insurance companies.

Suitable fire protection and detection systems shall be provided designed to the requirements of National Fire Protection Association (NFPA) standards. Gas detection systems and alarms shall also be included.

Fire protection shall consist of wet pipe, automatic deluge systems, hydrants, CO₂ gas flooding systems, and portable extinguishers of CO₂ and dry powder in sufficient quantities.

Areas to be covered by fixed protection installations shall be included but not be limited to:

-  All oil filled transformers
-  Gas engine
-  Lube oil system
-  Cable areas
-  Storage areas.

The gas engines are to be protected against fire by a CO₂ total flood system within the enclosures. The only other significant fire risks are associated with the lube oil systems on the gas engines, cable areas, stores and with oil contained within transformers. Such systems will be protected from fires by water deluge sprays. All necessary systems are required to be fire 'protected' with suitable extinguishing agents. Additional protections are to be provided by a ring main and hydrant system with hose/equipment cabinets located at strategic points. This ring main shall be provided with suitable section valves located in valve pits.

The firefighting water will be taken from the fire tank and will be pumped by a dedicated electric pump with a diesel powered back-up pump available in case of electrical failure. Pressure in the firefighting mains is maintained using an electric jockey pump.

A site wide fire and gas detection system will be provided to initiate the fire protection and alarms. Manual "break glass" fire alarms shall also be situated at strategic locations around the site and inside the buildings.

A modern electronic fully addressable master fire alarm panel shall be located in the Central Control Room. All local fire panels shall be linked into the master fire alarm panel. This master panel should have a separate section for the gas detection system. A repeater panel should be provided in the site gatehouse to allow swift identification of the affected fire zone to incoming local fire-fighting appliances. This master fire panel shall be provided with its own dedicated battery system.

Chapter 13

CONCLUSIONS

The ESIA carried out for Summit Alliance Port Limited River Terminal (SAPLRT) has shown that the environmental and social impact of the project is manageable. The project is of significant importance as it will expedite the export of goods to Chittagong port which otherwise is more expensive and risky. In addition the customs formalities will be done at the project site which will reduce shipment time as it will avoid port congestion at Chittagong.

It is recommended that for implementing the EMP and Grievance Redress Mechanism the institutional arrangement suggested in the ESIA is put in place.

References

1. Asian Development Bank's (ADB's) Safeguard Policy Statement (SPS, 2009).
2. BBS (2005): Bangladesh Bureau of Statistics (BBS), Government of People's Republic of Bangladesh.
3. BBS (2006): Bangladesh Population Census, Community Series Zila: Narayangonj, Bangladesh Bureau of Statistics (BBS), Planning Division, Ministry of Planning, Government of the Peoples' Republic of Bangladesh.
4. BBS (2006): Bangladesh Population Census, Community Series Zila: Narayangonj, Bangladesh Bureau of Statistics (BBS), Planning Division, Ministry of Planning, Government of the Peoples' Republic of Bangladesh.
5. BBS (2006): Bangladesh Population Census, Community Series Zila: Munshigonj, Bangladesh Bureau of Statistics (BBS), Planning Division, Ministry of Planning, Government of the Peoples' Republic of Bangladesh.
6. BBS (2011): Bangladesh Population Census, Community Series Zila: Munshigonj, Bangladesh Bureau of Statistics (BBS), Planning Division, Ministry of Planning, Government of the Peoples' Republic of Bangladesh
7. BCAS (1996): Socio-economic Survey in Reedland Forest area, Reedland Afforestation Project in Sylhet Forest Division (Report).
8. BCAS (2005-2006): Bangladesh Centre for Advanced Studies, Information Technology Division.
9. BPDB (2005-2006): Bangladesh Power Development Board, Annual Report. Geoscientific Activities for Mineral Study (2004-2008).
10. GoB (1982): Government of the People's Republic of Bangladesh, Acquisition & Requisition of Immovable Property Ordinance.
11. GoB (1989): Government of the People's Republic of Bangladesh, Property (Emergency) Acquisition Act.
12. GoB (2002): Planning Commission, Government of Bangladesh.
13. Government of East Pakistan (1970): "East Pakistan District gazetteers," SNH Rizvi, edits, East Pakistan Government Press, Dhaka.
14. GoB (1997), Environmental Conservation Rules 1997, Department of Environment, Ministry of Environment and Forest, Government of the People's Republic of Bangladesh, June 1997.

15. GoB (1997a), EA Guidelines for Industries, Department of Environment, Ministry of Environment and Forest, Government of the People's Republic of Bangladesh, June 1997.
16. IFC (2006): International Finance Corporation, Land Acquisition & Involuntary Resettlement Meghnaghat Port EIA Report, 1997.. IFC 2007), Environmental, Health, and Safety Guidelines for Ports, Harbors, and Terminals, International Finance Corporation, April, 200
17. IUCN Bangladesh (2002), Bio-ecological Zones of Bangladesh.
18. The World Conservation Union, Bangladesh Country Office, Dhaka, Bangladesh. pp. 139.
19. IUCN Bangladesh (2000a), Red book of Threatened Amphibians and Reptiles of Bangladesh. IUCN-Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp.
20. IUCN Bangladesh (2000b), Red book of Threatened Birds of Bangladesh. IUCN-Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp. 116.
21. IUCN Bangladesh (2000d), Red book of Threatened Fishes of Bangladesh. 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp. 116.
22. MOF (2006), Bangladesh Economic Review, Economic Adviser's Wing, Finance Division, Ministry of Finance, Government of People's Republic of Bangladesh.
23. NEP (1996): Government of People's Republic of Bangladesh, Ministry of Power Energy and Mineral Resources.
24. Private Communication (2005-2006): Information from Rural Industries Rahman, A. Atiq and Haider R. (1994) Environment and Development in Bangladesh, Vol. 1, University Press Limited, Dhaka.

25. Rashid, Harun er. (1991): Geography of Bangladesh, published by the University Press Limited, Dhaka.
26. WB (2007): The World Bank Operation Manual: Involuntary Resettlement
27. www.adb.org/documents/guidelines/environmental_assessment/environmental_categorization.pdf
28. World Bank (2004a), Good Practice Note: Using Poverty and Social Impact Analysis to Support Development Policy Operations, Washington, D.C., USA.
29. World Bank (2004b), Involuntary Resettlement Sourcebook, Planning and Implementation of Development Projects, Washington, D.C., USA.
30. World Bank (1999a) Pollution Prevention and Abatement Handbook 1998: Toward Cleaner Production, Washington, D.C., USA
31. World Bank (1999b) Operational Policies, OP - 4.01: Environmental Assessment, The World Bank, Washington, D.C., USA.
32. World Bank (1997), Roads and the Environment: A Handbook, World Bank Technical Paper No. 376, Edited by: Koji Tsunokawa and Christopher Habon.